

PROJECT MANUAL FOR:

HELIPAD & ROOF REPLACEMENT

BOONE COUNTY HOSPITAL
BOONE, IOWA

CONSTRUCTION DOCUMENTS

14 JUNE 2024

INVISION
PLANNING | ARCHITECTURE | INTERIORS

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INVISION #: 24003

SET NUMBER: _____

**SECTION 00 01 07
SEALS & SIGNATURES**

	<p>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 Architect under the laws of the State of Iowa.</p> <p>Name: Heidi Willis</p> <hr/> <table border="0"> <tr> <td>Signature</td> <td>Date</td> </tr> <tr> <td>Registration Expires: 06-30-2025</td> <td>Iowa Reg No. 07905</td> </tr> <tr> <td colspan="2">Pages or sheets covered by this seal: G and A Series</td> </tr> <tr> <td colspan="2">Sections: 01 – 14, except as noted in TOC</td> </tr> </table>	Signature	Date	Registration Expires: 06-30-2025	Iowa Reg No. 07905	Pages or sheets covered by this seal: G and A Series		Sections: 01 – 14, except as noted in TOC	
Signature	Date								
Registration Expires: 06-30-2025	Iowa Reg No. 07905								
Pages or sheets covered by this seal: G and A Series									
Sections: 01 – 14, except as noted in TOC									

	<p>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 Engineer under the laws of the State of Iowa.</p> <p>Name: John D. Rhodes</p> <hr/> <table border="0"> <tr> <td>Signature</td> <td>Date</td> </tr> <tr> <td>Registration Expires: 12-31-2024</td> <td>Iowa Reg No. 18297</td> </tr> <tr> <td colspan="2">Pages or sheets covered by this seal: S Series</td> </tr> <tr> <td colspan="2">Sections: 03, except as noted in TOC</td> </tr> </table>	Signature	Date	Registration Expires: 12-31-2024	Iowa Reg No. 18297	Pages or sheets covered by this seal: S Series		Sections: 03, except as noted in TOC	
Signature	Date								
Registration Expires: 12-31-2024	Iowa Reg No. 18297								
Pages or sheets covered by this seal: S Series									
Sections: 03, except as noted in TOC									

	<p>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 Engineer under the laws of the State of Iowa.</p> <p>Name: Mitchell S. McColloch</p> <hr/> <table border="0"> <tr> <td>Signature</td> <td>Date</td> </tr> <tr> <td>Registration Expires: 06-31-2025</td> <td>Iowa Reg No. 22853</td> </tr> <tr> <td colspan="2">Pages or sheets covered by this seal: M and P Series</td> </tr> <tr> <td colspan="2">Divisions: 21 - 23 as noted in TOC</td> </tr> </table>	Signature	Date	Registration Expires: 06-31-2025	Iowa Reg No. 22853	Pages or sheets covered by this seal: M and P Series		Divisions: 21 - 23 as noted in TOC	
Signature	Date								
Registration Expires: 06-31-2025	Iowa Reg No. 22853								
Pages or sheets covered by this seal: M and P Series									
Divisions: 21 - 23 as noted in TOC									



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 Engineer under the laws of the State of Iowa.

Name: Richard K. Larson

Signature

Date

Registration Expires: 06-31-2025

Iowa Reg No. 16014

Pages or sheets covered by this seal: E and T Series

Divisions: 26 - 28 as noted in TOC

END OF SECTION

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Legend:

KEDB	KEDBluestone
INV	INVISION Architecture
GCC	Graham Construction Company
RRE	Raker Rhodes Engineering

SECTION 00 0112 – NOTICE TO BIDDERS

NOTICE TO BIDDERS
CLINIC & INFRASTRUCTURE IMPROVEMENTS
BOARD OF TRUSTEES
BOONE COUNTY HOSPITAL
BOONE, IOWA

Sealed proposals will be received by the Construction Manager – Graham Construction at Boone County Hospital located at 1015 Union Street, Boone, IA on Tuesday, the 2nd day of July 2024 at 4:00 PM and opened at 4:05 PM the same day for furnishing all labor, materials, and equipment for all Bid Packages (01,02,03). The proposals will be presented to and considered by the Board of Trustees of the Hospital who shall decide the week of July 8th, time TBD but posted publicly. Such proposals received will be acted upon at such time and place or at such later time and place as may then be fixed.

DESCRIPTION: Furnish all labor, material and equipment required to accomplish the construction described in the specifications, indicated on the plans, and according to the schedule. The work includes, but is not limited to, general construction, sitework, paving, demolition, as well as electrical work for the paving improvements on site at the hospital.

Bids are for:

Bid Package 01 – Concrete Slabs and Paving

Bid Package 02 – Roofing

Bid Package 03 – HVAC, Plumbing & Fire Suppression, Electrical & Low Volt

Bidding documents may be obtained starting Friday, June 14th, 2024, from Action Reprographics, 5037 NE 14th St., Des Moines, IA 50313 (phone) 515-288-2146, upon deposit of the sum of one hundred dollars (\$100.00). This deposit will be refunded upon return of the bidding documents in good condition within thirty days after receipt of bids. MBI bid cards will be accepted. Include a nonrefundable check in the amount of twenty dollars (\$20.00) for plans to be shipped.

Bidding documents may be examined at:

Graham Construction Company
421 Grand Avenue
Des Moines, IA 50309
515-244-1279

Boone County Hospital
1015 Union Street
Boone, IA 50036
515-432-3140

Construction Update Plan Room
1406 Central Avenue, Box T
Fort Dodge, IA 50501
515-955-5500

Construction Update Plan Room & ISqFt
221 Park Street
Des Moines, IA 50309
515-288-8904

BID SECURITY: All bids must be accompanied by bid security payable to OWNER in an amount equal to at least 5% of the highest total amount including Add Alternates. The bid

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security may be in the form of a Certified Check, Cashier's Check or a bid bond executed by corporations authorized to contract as surety in the State of Iowa. The bid bond shall be executed by the Bidder on AIA Bond Document. Bid Security shall be in a separate envelope with the sealed bid and shall be forfeited to the Owner as liquidated damages in the event the bidder fails to enter into a contract and furnish a bond within ten days after his bid has been accepted. No Bidder may withdraw his bid for at least sixty (60) days after the scheduled closing time for the receipt of bids the 2nd day of July 2024.

The successful Bidder will be required to furnish and pay for satisfactory Performance Bond and Labor and Material Payment Bond in the amount of 100% of the Contract Price. Bond to be issued by a responsible surety approved by the Board of Trustees of Boone County Hospital.

The Notice to Proceed will be issued following acceptance of the executed Contract by the successful Bidder and the requisite Performance Bond and Labor and Material Payment Bond and insurance certificates, and a determination by the OWNER that it has secured permanent financing for the Project. All work for this package shall be completed within the given schedule.

QUALIFICATIONS: The Owner reserves the right to request qualification forms before issuing documents or before Contract is awarded, and to further reject any or all proposals or to waive technicalities or irregularities and to accept any bid which will best serve the interests of the Owner. By virtue of statutory authority, a preference shall be given to products and provisions grown and coal produced within the State of Iowa.

Notice is hereby given that a public hearing will be held concurrently with the Board of Trustees approval at a time to be determined but posted publicly. Please see local news sources and additional addendum to see updates to this timeline.

END OF SECTION 00 0112

SECTION 00 1100 – PROJECT DIRECTORY

Owner:

Boone County Hospital
1015 Union Street
Boone, IA 50036

Justin, Neely
E-Mail: jneely@bchmail.org

Invision

Invision Architecture
900 Mulberry Street
Des Moines, IA 50309

Architect:

Heidi Willis
563-419-4986
E-Mail: heidw@invisionarch.com

Construction Manager:

Graham Construction
421 Grand Avenue
Des Moines, IA 50309

Project Manager (main contact):

Vince Horras
319-360-7842 Cell Phone
E-Mail: vhorras@grahamconstruction.com

Project Coordinator:

Kamisha Wallace
515-244-1279 Office Phone
E-Mail: kwallace@grahamconstruction.com

Project Superintendent:

Jed Bockenstedt
515-447-3649 Cell Phone
E-Mail: jbockenstedt@grahamconstruction.com

END OF SECTION 00 1100

SECTION 00 1200 - INVITATION TO BID

A. Bids will be received from Contractors for the bid packages listed below for the complete construction of the Boone County Hospital – Helipad and Roof Replacement Project. The owner is Boone County Hospital. The Construction Manager is Graham Construction.

B. Bids will be received for the following Bid Packages:

Bid Package 01 – Concrete Slabs and Paving

Bid Package 02 – Roofing

Bid Package 03 – HVAC, Plumbing & Fire Suppression, Electrical & Low Volt

C. Sealed bids will be received by the Owner and Construction Manager at Boone County Hospital located at 1015 Union Street, Boone, Iowa 50036 until 4:00 PM CST on July 2nd, 2024. Bids to be submitted at a table in the 4th Floor Conference Room inside Boone County Hospital. Each bid must be enclosed in a separate envelope and shall be marked:

Boone County Hospital – Helipad Renovation
Attn: Ms. Mikaela Kientz, CEO
Bid Package XX
Bid Package Description

D. Bids received after this time will not be accepted.

E. Bids will be opened 5 minutes following 4:00 PM submission.

F. **Bidding documents may be obtained from Action Reprographics**, 5037 NE 14th St., Des Moines, IA 50313 (phone) 515-288-2146, upon deposit of the sum of one hundred dollars (\$100.00) plus a non-refundable twenty dollars (\$20.00) shipping fee. This deposit will be refunded upon return of the bidding documents in good condition within twenty days after receipt of bids. MBI bid cards will be accepted.

G. A pre-bid walk through will take place at 11:00AM-12:00PM on June 24th.

H. Bidding Documents may be examined at:

Graham Construction Company
421 Grand Avenue
Des Moines, IA 50309
515-244-1279

Boone County Hospital
1015 Union Street
Boone, IA 50036
515-432-3140

Construction Update Plan Room
1406 Central Avenue, Box T
Fort Dodge, IA 50501
515-955-5500

Construction Update Plan Room & ISqFt
221 Park Street
Des Moines, IA 50309
515-288-8904

I. Partial sets of documents will not be made available.

J. **QUESTIONS:** Pre-bid Requests for Information are due no later than Tuesday, June 25th, 2024 at 12:00 PM CST to allow adequate time for the questions to be addressed. Direct all questions, in writing, to the following individuals:

Architect:

Invision: Heidi Willis
Phone – 563-419-4986
E-Mail: heidw@invisionarch.com

Bid Package Descriptions, General Conditions, etc.:

Graham Construction, Vince Horras
Phone – 319-360-7842
E-mail – vhorras@grahamconstruction.com

Bid Package Descriptions, General Conditions, etc.:

Graham Construction, Jed Bockenstedt
Phone – 515-360-3964
E-mail – jbockenstedt@grahamconstruction.com

- K. **BID SECURITY:** Each bid shall be accompanied by bid security payable to the Owner **in an amount equal to at least 5% of the highest total amount including Add Alternates**. The bid security may be in the form of cash, a certified check, a cashier's check or a bid bond executed by corporations authorized to contract as surety in the state of Iowa. The bid bond shall be executed by the bidder on Iowa Guide 31 or AIA Document 310. The bid security shall be in a separate envelope from the sealed bid and shall be forfeited to the Owner in the event the bidder fails to enter into a contract and furnish a bond within ten days after his bid has been accepted. No qualified bid will be accepted.

END OF SECTION 00 1200

SECTION 00 2000- INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINITIONS

- 1.1 Bidding documents include the bidding requirements and the contract documents. The bidding requirements include the advertisement or invitation to bid, instructions to bidders, the bid form, other sample bidding and contract forms and the contract documents including addenda issued prior to receipt of bids.
- 1.2 The contract documents for the work consist of the Owner/Contractor agreement, the conditions of the contract (general and supplementary conditions), the drawings, the specifications and all addenda issued prior to and all modifications issued after execution of contract.
- 1.3 Definitions set forth In AIA document A232 - 2009 "General Conditions of the Contract for Construction" Construction Manager – Adviser Edition, or in other contract documents applicable to the bidding documents.

ARTICLE 2 - BIDDER'S REPRESENTATIONS

- 2.1 The bidder by making a bid represents that the bidder has read and understands the bidding documents and the bid is made in accordance with those documents.
- 2.2 The bidder has read and understands the bidding documents or contract documents, to the extent that such documentation relates to the work for which the bid is submitted.
- 2.3 The bidder has visited the site, become familiar with local conditions under which the work is to be performed and has correlated the bidder's personal observations with the requirements of the contract documents.
- 2.4 The bid is based upon the materials, equipment and systems required by the bidding documents without exception.

ARTICLE 3 - BIDDING DOCUMENTS

3.1 Copies

- A. **Complete sets of the bidding documents may be obtained from Action Reprographics, 5037 NE 14th St., Des Moines, IA 50313 (phone) 515-288-2146**, for the deposit sum indicated in the Invitation to Bid. The deposit will be refunded to plan holders who return the bidding documents in good condition within 20 days after receipt of bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A bidder receiving a contract award may retain the bidding documents and his deposit will be refunded. Successful subcontractors and material suppliers may retain their bidding documents and their deposit will be refunded if the Construction Manager receives written notification within the 30 calendar day period following receipt of bids.
- B. Bidders shall use complete sets of bidding documents in preparing bids. Neither the Owner nor the Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of bidding documents. No partial sets will be issued.
- C. In making copies of the bidding documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining bids on the work and do not confer a license or grant permission for any other use of the bidding documents.

3.2 Interpretation or correction of bidding documents

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Boone County Hospital
INVISION #24003

- A. The bidder shall carefully study and compare the bidding documents with each other, and with other work being concurrently or presently under construction to the extent that it relates to the work for which the bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.
- B. Bidders and sub-bidders requiring clarification or interpretation of the bidding documents shall make a written request which shall reach the Architect at least nine calendar days prior to the date for receipt of bids.
- C. Interpretations, corrections and changes of the bidding documents will be made by addendum. Interpretations, corrections and changes the bidding documents made in any other manner will not be binding and bidders shall not rely upon them.

3.3 Substitutions

- A. The materials, products and equipment described in the bidding documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- B. If the Architect or Construction Manager approves a proposed substitution prior to receipt of bids, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

3.4 Addenda

- A. Addenda will be mailed or delivered to all who are known by the Construction Manager to have a complete set of bidding documents.
- B. Copies of Addenda will be made available for inspection wherever bidding documents are on file for that purpose.
- C. No Addenda will be issued later than four (4) days prior to the date for receipt of bids except: (1) an Addendum withdrawing the request for bids; (2) an Addendum which includes postponement of the date for receipt of bids; or (3) an Addendum issued after receipt of bids and prior to execution of the contract.
- D. Each bidder shall ascertain prior to submitting a bid that he has received all Addendums issued, and the bidder shall acknowledge their receipt in the proper location on the bid form.

ARTICLE 4 - BIDDING PROCEDURES

4.1 Form and style of bids

- A. Submit bids in duplicate on forms identical to the form included with the bidding documents.
- B. Submit a copy of the Bid Package Description for each portion of the work included in the Bid. Fill in all blanks on the Bid Package Description by typewriter or manually by ink. All unit prices requested shall be submitted.
- C. Fill in all blanks on the bid form by typewriter or manually in ink.
- D. Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.
- E. Interlineations, alterations or erasures shall be initialed by the signer of the bid.

- F. All requested alternates shall be bid. If no change in the base bid is required, enter "No Change". If the alternate does not pertain to your bid package enter "Not Applicable". Bids may be rejected if alternate pricing is not included.
- G. Where two or more bids for designated portions of the work have been requested, the bidder may state the bidder's refusal to accept award of less than the combination of bids stipulated by the bidder.
- H. Each copy of the bid shall include the legal name of the bidder and a statement that the bidder is a sole proprietor, a partnership, a corporation or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the bidder to a contract. A bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the bidder.

4.2 Bid Security

- A. Each bid shall be accompanied by a bid security in the amount of 5% of the base bid and in the form of surety bond, cashier's check, cash or certified check pledging that the bidder will enter into a contract with the Owner on the items stated in his bid and will, if required, furnish bonds covering the faithful performance of the contract and the payment of all obligations arising there under. Should the bidder refuse to enter into such contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.
- B. Surety bond shall be written on AIA Document A310-2010 "Bid Bond" and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of power of attorney.
- C. The Owner will have the right to retain the bid security of bidders to whom an award is being considered until either:
 - 1. the contract has been executed and bonds have been furnished
 - 2. the specified time has elapsed so that bids may be withdrawn
 - 3. all bids have been rejected

4.3 Submission of bids

- A. All copies of the bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the bids and shall be identified with the project name, bid package number, the bidder's name and address. If the bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face of the envelope. Include the project name, bid package number and bid package title.
- B. Bids shall be deposited at the designated location prior to the time and date for receipt of bids.
- C. The bidder shall assume full responsibility for timely delivery at the location designated for receipt of bids.
- D. Oral, telephonic, or telegraphic Bids are invalid and will not receive consideration.

4.4 Modification or withdrawal of bid

- A. A bid may not be modified, withdrawn or canceled by the bidder after the stipulated time and date designated for the receipt of bids, and each bidder so agrees in submitting his bid.
- B. Prior to the time and date designated for receipt of bids, a bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids. Such notice shall be in writing over the signature of the bidder or by telegram; if by telegram, written confirmation over the signature of the bidder shall be mailed .and postmarked on or before the date and time set for receipt of bids, and it shall be so worded as not to reveal the amount of the original bid.
- C. Withdrawn bids may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these instructions to bidders.
- D. Bid security shall be in an amount sufficient for the bid as modified or resubmitted.

ARTICLE 5 - CONSIDERATION OF BIDS

5.1 Opening of bids

- A. The properly identified bids received on time will be opened publicly. An abstract of the information may, at the discretion of Owner, be made available to the bidders within a reasonable time.

5.2 Rejection of bids

- A. The Owner will have the right to reject any or all bids.

5.3 Acceptance of bid (award)

- A. It is the intent of the Owner to award a contract to the lowest responsible bidder provided the bid has been submitted in accordance with the requirements of the bidding documents and does not exceed the funds available. The Owner will have the right to waive informalities or irregularities in a bid received and to accept the bid which, in his judgment, is in his own best interest.
- B. The Owner will have the right to accept alternates in any order or combination and to determine the low bidder on the basis of the sum of the base bid and the alternates accepted.

ARTICLE 6 - POST BID INFORMATION

6.1 Submittals

- A. The bidder shall, within seven days of notification of selection for the award of a contract for the work, submit the following information to the Construction Manager
 - 1. A designation of the work to be performed by the bidder with the bidder's own forces;
 - 2. The proprietary names and the suppliers or principal items or systems of materials and equipment proposed for the work;
 - 3. A list of names of the subcontractors or other persons or entities proposed for the principal portions of the work.
- B. The bidder will be required to establish to the satisfaction of the Construction Manager and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the work described in the bidding documents.
- C. Prior to the award of the contract, the Construction Manager will notify the bidder in writing if either the Owner or the Construction Manger, after due investigation, has reasonable objection to any such proposed person or entity. If the Owner or Construction Manager has reasonable objection to such proposed person or entity, the bidder may, at the bidder's option:

1. withdraw the bid
2. Submit an acceptable substitute person or entity with an adjustment in the bid price to cover the difference in cost occasioned by such substitution.

D. The Owner may accept the adjusted bid or price may disqualify the bidder.

ARTICLE 7- PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.1 Bond requirements

- A. The bidder shall furnish bonds covering the faithful performance of contract and the payment of all obligations arising there under. Bonds may be secured through the bidder's usual sources. The cost furnishing of such bonds shall be included in the bid.
- B. If the Owner requires that bonds be obtained from other than the bidder's usual source, all change in cost will be adjusted as provided in the contract documents.

7.2 The time of delivery and form of bonds

- A. The bidder shall deliver the required bonds to the Construction Manager not later than three days following the date of execution of the contract. If the work is to be commenced prior thereto in a response to a letter of intent, the bidder shall, prior to commencement of the work, submit evidence satisfactory to the Construction Manager that such bonds will be furnished and delivered.
- B. The bonds shall be written on AIA Document A312-2010 "Performance Bond and Payment Bond." Both bonds shall be written in the amount of the contract sum.
- C. The bonds shall be dated on or after the date of the contract.
- D. The bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a current and certified copy of the power of attorney.

END OF SECTION 00 2000

SECTION 00 4100 – BID FORM - STIPULATED SUM

PROJECT:

Helipad & Roof Replacement
Boone County Hospital
INVISION #24003

BID TO: Boone County Hospital
1015 Union St.
Boone, IA 50036
Attention: Ms. Mikaela Kientz

BID FROM:

Bidder's Company Name

Telephone Number

Date of Proposal

Fax Number

Contact Person

E-mail Address

*****ATTACH A COPY OF THE BID PACKAGE DESCRIPTION(S) TO THIS BID*****

BID FOR: Contract work for the Boone County Hospital Helipad Roof Replacement project as shown in Bidding Documents Dated: June 14th 2024.

BID PLACE: Bids are to be submitted to Graham Construction on behalf of Ms. Mikaela Kientz , Boone County Hospital.

Bids will be received between the hours of 3:00 PM and 4:00 PM CST.

BIDS SHALL BE DELIVERED TO: Boone County Hospital
4th Floor Conference Room Inside the Hospital
1015 Union Street
Boone, Iowa 50036

Hand deliver bids to the address listed above.

BID DATE: Bids are due on Tuesday, July 2nd 2024

BID TIME: Bids are due no later than 4:00 PM CST.

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. Qualified Bids will not be accepted.
- K. 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. 1 Dated _____ Addendum No. 2 ___ Dated _____

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

5. BIDDER will complete the work for the Bid Package(s) listed below in accordance with the Contract Documents (all bids will be Prime Contract bids to include all labor, material, shop drawings, superintendence, project management, delivery, unloading, tools, equipment, rigging, cleaning, adjusting, etc. to complete the work):

Bid Pkg	Bid Package Title	Written Bid Amount	Numerical Bid Amount
00	General Requirements	INCLUDED BY REFERENCE TO BE PART OF ALL BID PACKAGES	INCLUDED
01	Concrete Slab & Paving		\$
02	Roofing		\$
03	HVAC, Plumbing & Fire Suppression, Electrical and Low Volt		\$

In accordance with the aforementioned documents, we propose the following Lump Sum Price for the above combined Bid Packages: \$ _____

Written Bid Amount

6. Combined Bid pricing must be broken out in Bid Package Breakouts as shown above.
7. Will BIDDER accept an award based on any one of the individual Bids included in the Combined Bid? Circle one: Yes / No
8. ALTERNATES – refer to Specification Section 01 2300 for descriptions. If the items below are left blank it will be considered “No Change” and zero dollars if the alternate is accepted.
 - A. Alternate 1: After hours work for concrete demolition and removal – complete.
 BP ___ ADD / DEDUCT _____ Dollars \$ _____
 (circle one)
9. BIDDER agrees that all Work will be substantially complete per the schedule as outlined in Specification Section 01 1520 & 01 1520.01.
10. 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. Bid security shall be in a SEPARATE sealed envelope and labeled “Bid Security”
 - B. Attach a signed copy of Bid Package description(s) to this Bid Form.
 - C. Statement of Resident Bidder Status

STATEMENT OF RESIDENT BIDDER STATUS PURSUANT TO IOWA CODE SECTION 73A.21
In connection with the decision to award a bid on a public improvement, I do certify that the person or entity named below is a:
Check only one and provide all requested information:
<input type="checkbox"/> Resident Bidder [By definition, a person or entity authorized to transact business in this state, having a place of business for transacting business in this state at which it is conducting and has been conducting business for at least three years prior to the date of the first advertisement for a public improvement]
The undersigned resident bidder has conducted business during the previous three years at each of the following Iowa addresses (attach an additional sheet if necessary) and these offices were each suitable for more than receiving mail, telephone calls, and emails:
Dates: ___/___/___ to ___/___/___ ___/___/___ to ___/___/___ ___/___/___ to ___/___/___ Address: _____ City ZIP: _____
By checking the “Resident Bidder” box above, the undersigned hereby certifies that it is not a subsidiary of another entity that would be a nonresident bidder if the other entity were to bid on the public improvement in its own name.
[Note: By statutory definition, if you have not been conducting business in Iowa for at least three years, you are treated as a nonresident bidder and must check the next box]
<input type="checkbox"/> Nonresident Bidder [By definition, a person or entity who does not meet the definition of a resident

bidder above] 1. Name the state or foreign country of domicile: _____ 2. Check only one of the following: <input type="checkbox"/> The undersigned nonresident bidder hereby certifies that the nonresident bidder's state or foreign country of domicile offers no preferences to bidders that are residents of that state or foreign country. <input type="checkbox"/> The nonresident bidder's state or foreign country of domicile offers preferences to bidders that are residents of that state or foreign country. (On an attachment to this Statement and marked as "Preference List," identify each preference offered by the nonresident bidder's state or foreign country of domicile, along with appropriate legal citations to those preferences.) The undersigned nonresident bidder hereby certifies that except as set forth on the attached Preference List, the nonresident bidder's state or foreign country of domicile offers no other preferences to resident bidders of that state or foreign country.
I declare under penalty of perjury that the statements made on this document are true and complete to the best of my knowledge and that my failure to provide accurate and truthful information may be considered a reason to reject any of my bids.
Firm Name: _____
Signature: _____
Date: _____

11. BID FORM SIGNATURE(S):

SUBMITTED: _____, 20_____
 (Date)

BY: _____
 (Bidder - print the full name of your firm)

 (Signature and *printed* name of person authorized to sign)

 (Title)

END OF SECTION 00 4100

SECTION 00 5000 - AGREEMENT FORM

ARTICLE 1 – AGREEMENT FORM

1. AIA Document A132/CMa Standard Form of Agreement Between Owner and Contractor, 2019 Construction Manager as Adviser Edition, is bound within this project manual as part of the Contract Documents. This is the final modified agreement to be used for the parties.

Modified AIA A132/CMa Contract Attached

END OF SECTION 00 5000

**SECTION 00 52 00
AGREEMENT FORM**

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.

1.03 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

DRAFT AIA® Document A132™ - 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

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

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

«Boone County Hospital»
«1015 Union St.
Boone, IA 50036 »
« »

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

«TBD through bid process »« »
« »
« »
« »

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

«Boone County Hospital – Helipad Renovation»
«1015 Union St.
Boone, IA 50036 »

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

«Graham Construction Company »« »
«421 Grand Avenue »
«Des Moines, IA 50309»
« »

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

«Invision Architecture»
« 900 Mulberry Street »
«Des Moines, IA 50309 »

The Owner and Contractor agree as follows.

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

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

This document is intended to be used in conjunction with AIA Documents A232™-2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™-2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™-2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™-2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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EXHIBIT B DETERMINATION OF THE COST OF THE WORK

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

The date of this Agreement.

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

Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:

(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

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

Portion of Work	Substantial Completion Date
All work	11/1/2024

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

(Check one of the following boxes and complete the necessary information.)

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

[] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete
All work	November 1, 2024

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:

(Check the appropriate box.)

[] Stipulated Sum, in accordance with Section 4.2 below

[] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

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

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit (\$0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:

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

Item	Units and Limitations	Price per Unit (\$0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:

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

Item	Units and Limitations	Price per Unit (\$0.00)

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed « » (\$ « »), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates

§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

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

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price: *(Identify each allowance.)*

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based: *(Identify each assumption.)*

« »

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

« NONE »

§ 4.6 Other:

(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

« NONE »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

« »

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the «20th» day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the «30th» day of the «following» month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Construction Manager receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

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

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

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

- .1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;
- .2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- .3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232-2019;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232-2019;
- .5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- .6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

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

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

- .1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- .2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- .4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232-2019;

- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;
- .5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner’s auditors in such documentation; and
- .6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor’s Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner’s auditors acting in the sole interest of the Owner.

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

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

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

« 5% until substantially complete »

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« None »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:

(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

<< >>

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

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

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

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

<< >>

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

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

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and
- .3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

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

<< >>

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

<< >> % << >>

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

«Heidi Willis»
«Invision Architecture»
« 900 Mulberry Street »
«Des Moines, IA 50309 »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

[] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[« »] Litigation in a court of competent jurisdiction.

[« »] Other: *(Specify)*

« »

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

« »

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

- .1 Take the Cost of the Work incurred by the Contractor to the date of termination;
- .2 Add the Contractor’s Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor’s Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232–2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

« »

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term “profit” shall be understood to mean the Contractor’s Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

«Graham Construction Company »

«Vince Horras»

«421 Grand Avenue »

«Des Moines, IA 50309 »

« »

« »

§ 8.3 The Contractor’s representative:

(Name, address, email address, and other information)

«TBD »

« »

« »

« »

« »

« »

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« N/A »

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor’s Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor’s skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner’s interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition
- .2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit
- .3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

- .5 Drawings as provided by InVision 06/14/2024

Number	Title	Date

- .6 Specifications as provided by InVision 06/14/2024

Section	Title	Date	Pages

- .7 Addenda, if any:

Number	Date	Pages

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

- .8 Other Exhibits:

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

AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser

Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232-2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

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

OWNER (Signature)

«Mikaela Kienitz »

«CEO, Boone County Hospital »

(Printed name and title)

CONTRACTOR (Signature)

« TBD »

« »

(Printed name and title)

SECTION 00 6000 – GENERAL CONDITIONS

ARTICLE 1 – GENERAL CONDITIONS

- 1 AIA Document A232/CMA General Conditions of the Contract for Construction, 2019 Construction Manager as Adviser Edition, is the General Conditions between the Owner and the Contractor, is bound within this project manual as part of the Contract Documents.

Modified AIA A232/CMA General Conditions Attached

END OF SECTION 00 6000

DRAFT AIA® Document A232™ - 2019

General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:

(Name, and location or address)

«Boone County Hospital – Helipad Renovation»
«1015 Union St.
Boone, IA 50036 »

THE CONSTRUCTION MANAGER:

(Name, legal status, and address)

«Graham Construction Company »
«421 Grand Avenue
Des Moines, IA 50309»

THE OWNER:

(Name, legal status, and address)

«Boone County Hospital»
«1015 Union St.
Boone, IA 50036 »

THE ARCHITECT:

(Name, legal status, and address)

«Invision Architecture»
« 900 Mulberry Street »
«Des Moines, IA 50309 »

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

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

This document is intended to be used in conjunction with AIA Documents A132™-2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™-2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™-2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.



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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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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 other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 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.

§ 1.1.8 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.

§ 1.1.9 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.

§ 1.1.10 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 Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

§ 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 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.3.7 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.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 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 review by the Construction Manager and prior approval of the Architect, and the Construction Manager or 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 Construction Manager's and Architect's and their respective consultants' 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 Construction Manager or Architect in their 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 2.3.5, 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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, the Construction Manager, and the 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. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager 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 the Project 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, in consultation with the Construction Manager, 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, Construction Manager, 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 Construction Manager or 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 or portions thereof 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 Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay 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, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, 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, in consultation with the Construction Manager, 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, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either 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, Construction Manager, 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, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require

additional time for review. Failure of the Construction Manager 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, Construction Manager, 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, and the Construction Manager's use in developing the Project schedule, 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. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 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 Construction Manager's and Architect's approval. The Architect and Construction Manager'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 Construction Manager and 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 participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 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 Construction Manager, Architect, and Owner, and delivered to the Construction Manager 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 and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 Construction Manager and 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 Construction Manager and 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, the Architect, and the Construction Manager 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. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 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 Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 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.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 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, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, 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, or Construction Manager with the Owner's approval, 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, Construction Manager, 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, Construction Manager, 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, Architect, or Construction Manager. 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 through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and 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 AND CONSTRUCTION MANAGER

§ 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 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and 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, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager 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 Construction Manager 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 other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 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. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and 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.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 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 Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.19 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 so rendered in good faith.

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

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request 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 other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 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 Construction Manager, for review by the Owner, Construction Manager 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 Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager 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, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager 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, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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 with Own Forces and to Award Other Contracts

§ 6.1.1 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 the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 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's own forces, Separate Contractors, Construction Manager and other 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's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and 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 or other Contractors' 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 Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 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, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors 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, other 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 Construction Manager, with notice to 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, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager 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

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, 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 Construction Manager and signed by the Owner, Construction Manager 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 Construction Manager 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 Construction Manager 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 Construction Manager and 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 Construction Manager 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 Construction Manager and 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 Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The 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 Construction Manager and 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 Construction Manager shall 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 Construction Manager 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 Construction Manager 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, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (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, based on the recommendation of the Construction Manager, 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 Construction Manager, 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 Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or 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 fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager 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, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien 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 Construction Manager and 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 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager'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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation 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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 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 Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or 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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or 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 or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the 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 or other 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 or Construction Manager withholds certification for payment under Section 9.5.1, 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 Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project 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 Construction Manager and 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 Construction Manager 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 Owner, Construction Manager and Architect 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, Construction Manager 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 Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager 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 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 notify the Construction Manager, and the Contractor and Construction Manager shall jointly 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 list, the Architect, assisted by the Construction Manager, 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 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, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, 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 completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final

Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their 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 Construction Manager's and Architect's final Certificate for Payment or Project 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 through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and 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 through the Construction Manager 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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the

Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 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;
- .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; and
- .4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4. 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, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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

§ 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, Construction Manager 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, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager 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, Construction Manager, Architect, their 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, Construction Manager and Construction Manager's consultants, and the 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 directly to the Owner, and separately to the Construction Manager, 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 both the Contractor and the Construction Manager, separately and 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 directly to the Contractor, and separately to the Construction Manager, 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 Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) 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 Construction Manager,

Construction Manager's consultants, Architect, Architect's consultants, other Contractors, 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, Architect, and Construction Manager 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 Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, 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 Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their 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 Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or 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 Construction Manager or 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 Construction Manager's and 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, Construction Manager 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, Separate Contractors, or other 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, Construction Manager, 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager, 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 Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager's and 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 Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or 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 Construction Manager has not certified or 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, 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, Construction Manager 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 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, Construction Manager and 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, after consultation with the Construction Manager, 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 Construction Manager's and 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, 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 the 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 this 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 Construction Manager and 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, the Construction Manager, 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 of 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 7000 – INSURANCE REQUIREMENTS

ARTICLE 1 – SAMPLE INSURANCE CERTIFICATE

1. The Owner has determined the minimum insurance requirements during the execution of this agreement. See the sample insurance certificate for limits, waiver of subrogation, & additional insured requirements.
2. Attached sample insurance certificate will be 00 7000.01 Insurance Requirements.

END OF SECTION 00 7000

**SECTION 00 72 00
GENERAL CONDITIONS**

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION

SECTION 00 8000 – BID PACKAGE #00

Bid Package 00: General Requirements

The following general provisions **shall apply to all bid packages.**

Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specifications.

Work that is not specifically shown, listed or detailed in the Contract Documents, but necessary for a complete system and could be reasonably inferred by the nature of the scope of work shall be included in this bid. In the event there is a contradiction in the plans or specification, request clarification or assume the more costly option.

All work in this Bid Package shall be provided in accordance with OSHA regulations and applicable state and local codes. Provide proof of all training and certificates required and provide written safety and fall protection programs. **This project is participating in the OSHA Partnership; all employees on site will participate fully including Monday safety meetings and monthly third-party safety job site walk-throughs.**

1. The general construction **building permit** will be applied for and paid for by the Construction Manager. Each Prime Contractor shall apply for and pay for any and all permits required to complete their specific bid package scope of work. Include all permits, tap fees, development fees, etc. that may be charged by the utility company, city, county, state and any other agency having jurisdiction. Copies of all permits must be provided to the Construction Manager for record.
2. All contractors that have scope of work that is going to be completed outside of flagging must complete the scope of work with full OSHA compliant fall protection.
3. All contractors are to include any and all inflationary/material escalation costs to complete the project in their bids.
4. After bid day, no change orders will be accepted due to inflation or material escalation.
5. Dress code: each Prime Contractor, Subcontractor, Sub-Subcontractor, etc. shall ensure that each worker has the following and is worn at all times. The Construction Manager has the right to ease the requirements at their discretion.
 - a. Hard hats, safety glasses, work boots/shoes meeting OSHA requirements.
 - b. Gloves are required for to be worn while performing work.
 - c. Pants (no shorts).

d. Sleeved shirt.

6. Construction employee vehicle parking in the hospital parking lot(s) is strictly prohibited. Limited parking will be provided for Prime Contractors in the staging area. See Construction Manager's representative for availability. Job Trailers are not allowed to be stationed on site or in the designated parking lot provided, unless coordinated with the Construction Manager, limited space is available.
7. Submittals 80 days from contract execution or to otherwise not impact the project schedule.
8. Closeouts 60 days prior to substantial or to otherwise not impact the project schedule.
9. Construction Manager may request proof of order/procurement and contractor is required to provide.
10. Contractors required to fill out JHA's and construction manager may request to receive these.
11. All prime contractors are responsible to keep updated with project information through Procore
12. All prime contractors required to submit RFI's to Procore on their own.
13. All contractors on site must be present in schedule/foreman's meeting.
14. Everyone is required to do their own cleanup typical to their scope of work.
15. Everyone is required to do their own snow removal as required to continue their scope of work.
16. Prior to starting work, all workers must attend a Site Safety Orientation located in the Graham trailer to go over hospital policies and safety requirements and receive a hard hat sticker before they can enter the jobsite to work or deliver material for use by installers. Please coordinate with Graham when new employees arrive on site. All workers will also be badged by the hospital and must keep on them at all times while on site.
17. Each Contractor is responsible for following, at minimum, all safety polices as outlined by Graham in the Site Orientation as well as in the Site-Specific Safety manual.
18. Each Contractor shall follow the JHA (Job Hazard Analysis) Policy outlined in the Site-Specific Safety Manual and Bid Package 01 5800 CONSTRUCTION MANAGER SAFETY POLICY.
19. The hospital need to remain in operation 24/7, the hospital can request work be shut down at any time for noise, vibration, or any inconvenience to their everyday operation. Coordinate disruptive work with the Construction Manager and give adequate notice for all shutdowns and inconvenient work. Work causing noise, vibration, or other interruption needs to be coordinated at least 72 hours

before the start of work and could be requested to happen after hours. This requested afterhours work will not be an additional cost to the project.

20. The jobsite and staging areas are limited for space. Material will need to be delivered as required for the work to occur as stocking of material for the entire project will not be available. Delivery hours will be determined by the hospital, and then the Construction Manager will coordinate these hospital hours with the Prime Contractor. Transporting material to and from this location is the responsibility of each contractor. The Prime Contractors are responsible for receiving all deliveries, unloading, and moving of materials as it relates to their contract scope. All deliveries must be coordinated and scheduled with the Construction Manager.
21. All demolition trash, debris, and material transported through the existing hospital will need to be covered. Contractor to provide dust control measures so trash carts' wheels and anyone's foot traffic won't track dust out of the construction areas.
22. Step-Up Scaffolds will not be allowed for use of any type on the jobsite. Contractors attempting to use step-up scaffolds for installation or storage of material will be required to stop work until scaffolds are removed from site and a safer alternative is acquired.
23. No Smoking is allowed on site, except in Designated Smoking Areas, which will be outlined in the Contractor's required Orientation. Contractors found smoking outside of designated areas will be removed from site immediately.
24. Where work occurs in existing areas/rooms that have finishes to remain, install poly and/or other means to protect existing cabinetry, equipment and room finishes.
25. All work above ceilings where those ceilings are not shown to be removed and replaced in the Contract Documents will need to be removed and replaced. This note applies to phasing and scheduling as well. For any work that occurs above ceilings before or after those ceilings get replaced because of phasing, each contractor will need to remove and replace ceilings as needed to do the work and will be responsible for any damages incurred.
26. Take adequate safety precautions to protect patients, visitors, hospital staff and other construction workers as needed or required by OSHA requirements. Coordinate with the Construction Manager and Owner when closing an occupied area for exploratory and/or construction activities.
27. Each Prime Contractor is responsible for providing fresh, clean, potable water for their workers and workers of their subcontractors and sub-subcontractors per OSHA requirements. Each contractor

must also have 1st AID kits readily available on site for their workers and subcontractors per OSHA requirements.

28. Each Prime Contractor shall restore all public and private land disturbed by their bid package to the original condition.
29. Existing streets and roadways to and from the site shall remain free from damage by work performed by each Contractor. Repair any damage caused by this contractor scope to existing public roadways at no additional cost to the Owner. This applies to the public improvement roads on the project site. Final discretion of responsible parties will be determined by the Construction Manager.
30. Locate and protect all existing utilities to remain. Confirm locations prior to demolition and provided temporary utilities as required. When existing utilities are in the work area they shall be pot-holed to located.
31. Provide and maintain all barricades required to protect the public and workers. Barricades will remain in place until work by all bid packages is complete. Remove barricades after work is complete. Barricades shall clearly mark and block the hazards present and keep the public and other workers safe from harm.
32. Each Prime Contractor is responsible for protecting their work until acceptance by the owner. Each Prime Contractor is responsible for respecting the work completed by all other Prime Contractors and shall be responsible for replacing anything damaged.
33. Each Prime Contractor shall provide **daily** jobsite clean-up for debris and dust generated by the installation of their scope of work. Haul debris to the dumpster provided by the Construction Manager. **Daily** jobsite clean-up shall consist of all prime contractor's employees cleaning the work area for at least 30 minutes before leaving.
34. All extension cords shall be rolled up and checked for cuts or defects at the end of each workday. Damaged cords or cords with missing ground pins will be destroyed and removed from site at contractor's expense.
35. Each Prime Contractor shall provide all layout and surveying as required to complete their scope of work.
36. The cost of testing and inspections shall be paid for by the Owner as required by the Contract Documents. All testing and inspections shall be called for by each Prime Contractor and tests shall

be coordinated with the Construction Manager. Costs of retesting due to failed tests will be the responsibility of the Prime Contractor.

37. Each Prime Contractor is responsible for cutting, protecting and covering penetrations in the roof, slab on grade and walls to install their work. Follow all OSHA guidelines for covering, securing and marking holes. Make the Construction Manager aware of all penetrations, holes, etc. prior to cutting or uncovering.
38. All work to be completed in accordance with the schedule and phasing included in the specification section and as noted in the Contract Documents. The contractor shall include additional mobilizations as required to meet the schedule and phasing as noted.
39. The cost to move materials shall be included. Each prime contractor is responsible for storage and protection of their materials prior to and following installation until accepted at substantial completion.
40. As applicable, each Contractor shall provide, maintain and empty a concrete wash-out container for use of any concrete, grout, mortar, etc. generated by their scope of work. The concrete wash-out spoils shall be disposed off-site in a legal manner. Coordinate all aspects of the concrete wash-out with Construction Manager. NOTE: Any other means of concrete wash out shall be approved by the Construction Manager 10 days prior to commencement of concrete or other cementitious work.
41. Each prime contractor is responsible for always providing a Superintendent or Foreman on site while workers are on site. Same aspect applies to weekend work that is requested by said contractor.
42. Each Prime Contractor is responsible to have a minimum of one English speaking supervisor on-site during the duration of the contractor's work.
43. All work to be completed in accordance with the schedule included in specification section 01 1520 and as noted in the Contract Documents. The contractor must include additional mobilizations as needed to meet the schedule as noted.
44. Include taking any deliveries related to this bid package, and moving materials and clean-up as required.
45. The existing hospital will remain in everyday operation. The hospital can request work be shutdown at any time for noise, vibration, or any inconvenience to their everyday operation. Coordinate when this work can occur with the Construction Manager. Give adequate notice for all shutdowns and inconvenient work to the Construction Manager.

46. Each Prime Contractor is responsible to supervise all subcontractors and suppliers under their contract. If the Construction Manager must supervise or coordinate a Prime Contractors workers or subcontractors, the Construction Manager will charge \$130 per hour.
47. Each Prime Contractor is responsible for replacing anything they damage such as spray fireproofing, building components, etc that are compromised by their work
48. Each Prime Contractor is responsible to provide fire and acoustical caulking of any penetrations made by their scope of work per wall types and ratings. Patch any openings made by this bid package as needed for penetrations in existing walls, floors, and ceilings.
49. The use of internal combustion type equipment inside the building is not allowed without prior approval by the Construction Manager at least 1 week prior to commencement of the work. For any internal combustion equipment used, provide carbon monoxide/carbon dioxide scrubbers on the equipment.
50. Coordinate shop drawings and installation with other trade contractors. All work shall be installed to provide the maximum benefit to the Owner and allow for full access to equipment requiring maintenance.
51. Each Contractor is to fill out a hot work permit prior to commencement of work and must be filled out weekly as they expire. Please see construction manager for permits and location to post permit.
52. All materials within proximity to the helicopter landing pad are required to be tied down before any air lifts. Coordinate with Construction Manager and hospital.
53. Prime Contractors are responsible for providing a fire watch on a continuous basis if they need to shut the Fire Protection system down any longer than 4 hours until the system is active.
54. Prime Contractors are responsible for providing a fire watch for any hot work requiring the Fire Protection system being shut down and fill out appropriate paperwork.
55. Prime Contractors are required to follow all safety requirements implemented by the Construction Manager. This includes but not limited to: Construction Manager Site Specific Safety Plan, PPE requirements, Job Hazard Analysis Forms (JHAs), fall protection requirements, safety orientation, owner required safety orientation, and owner safety requirements.

- a. *JHA forms and proper training on filling out each form will be provided by the Construction Manager.*
56. This project will utilize Last Planner Construction Schedule tools to plan the work, update the schedule, and monitor progress. It is a requirement to provide all paperwork and attend all meetings as requested by the Construction Manager. Some of the items included are, but not limited to:
 - a. A minimum of one schedule coordination meeting will be held with the Prime Contractor project managers and foremen that will be on site daily. These meetings may last a full day and are mandatory. In this meeting, you will be required to list all activities, assign accurate durations, and work with other contractors to sequence the activities as a group.
 - b. Weekly foremen's meetings will be held where weekly work plans (WWP's) will be turned in to the Construction Manager for review and the 6-week project schedule will be discussed. Weekly work plans are required to be turned in prior to the weekly meeting so all activities can be compiled into one WWP and distributed at the meeting.
 - c. Daily stand-up meetings are a daily progress check and planning session for the following day. These meetings will be held on the project site, foremen for all trades on site are required to be there, and they should take no longer than fifteen minutes per day.
57. Project foreman's meetings will be held weekly at the site and Project Managers shall attend bi-weekly. Contractor shall have a representative at each meeting while contractor is on site or within 4 weeks of starting a task. This representative shall have knowledge of the project and empowered to make manpower and financial decisions while at the meeting. Absences to be discussed with the construction manager prior to the meeting.
58. Procore will be used for maintaining project information. Each contractor shall check the program at a minimum of twice a week. The cost of ProCore is by the Construction Manager.
59. Each Prime Contractor will be responsible for completing two punch lists per phase and/or area. One for the Construction Manager and one for the Architect / Owner. Corrections to the Construction Manager punchlist must be complete before the Architect / Owner punch list starts. These will be managed through Procore, and it is the responsibility of each Contractor to maintain their assigned items in Procore.
60. All site observation reports must be responded to within 5 working days and should not alter the project schedule. These will be managed through Procore, and it is the responsibility of each Contractor to maintain their assigned items in Procore.
61. Provide all work per the contract schedule. Durations are not always intended to be cumulative and must be interpreted to the context shown in the schedule. The Prime Contractor understands that there will be concurrent work activities taking place that may require additional supervision, manpower, and equipment or material deliveries to accommodate the schedule needs. Provide sufficient labor, material, and equipment to maintain progress in accordance with project schedule. Durations for each activity are to be maintained. Start dates may shift according to the Construction Manager's schedule.

62. Each prime contractor is responsible to field verify all dimensions prior to fabrication of products.
63. All Closeout Documents must be provided to the Construction Manager by the designated due dates provided through Procore. Due dates will be set for two months prior to the first designated turnover date. Closeout Documents must be 100% submitted prior to Final Billing. If Closeouts are not submitted by the designated due date, monthly payment will be withheld at the discretion of the Construction Manager.
64. Failure to perform work to meet the schedule, quality, sequencing, etc., will result in the supplementation of work at the Construction Manager's discretion. This supplemented work will be back charged to the trade failing to perform the original designated work. ***Any task to be performed by each bid package that is delayed more than 5 days from the scheduled date will qualify for supplemented work.***
65. All time and material work orders must be signed within 48 hours by the prime contractor foreman and Graham Superintendent, or they will not be paid.
66. Prime Contractor to provide proof of purchase, shipment, reception, or production upon the request of the Construction Manager.
67. Prime Contractor to be adequately qualified to perform work in a healthcare environment as outlined below:
 - a. Prime Contractor has completed three similar projects in size, type, and scope in the past seven years.
 - Prime Contractor to provide reference list with bid including customer information.
 - b. Prime Contractor will have an afterhours/24-hour emergency service under the entire contract and warranty period.
 - c. Prime Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in Specifications.
 - d. Prime Contractor must have a competent person on site during all times while any direct subcontractors are on site.
 - e. Field and office management/supervisors must have a minimum of three years of healthcare experience.
 - f. All supervision and project management must have completed infection control and risk assessment training.
 - g. Prime Contractor to provide reference list with bid including customer contract information.
 - h. All supervision must have a minimum of 10 hours OSHA training.

i. All supervision must have CPR / First Aid Training.

70. Prime Contractors are not allowed to order or eat in the hospital's cafeteria or dining room.

END OF SECTION 00 8000

SECTION 00 80 01 – BID PACKAGE #01
Bid Package 01: Site, Piers, Concrete

Furnish all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shop drawings, field measurements, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all mobilizations, phasing, shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule.

This bid package includes, but is not limited to the following scope of work:

1. Bid Package #00 – General Requirements
2. Plans by INVISION dated June 14th, 2024
3. This Bid Package includes, but is not limited to the following scope of work:
 - a. Specifications from the Project Manual by INVISION, dated June 14th, 2024 including, but not limited to the following sections:
 - i. 02 41 00 Demolition
 - ii. 03 30 00 Cast-in-Place Concrete
 - iii. Division 07 as it pertains to this scope of work including but not limited to
 1. 07 21 00 Thermal Insulation
 2. 07 92 00 Joint Sealants
4. All testing and inspections shall be scheduled by this bid package and coordinated with the Construction Manager. The cost of initial testing and inspections will be paid for by the Owner. All re-testing for failed tests due to deficient work, or costs for any testing cancellations or delays shall be paid for by the Contractor.
5. Where demolition of existing is only partial, demolition shall be done to a point needed to be able to build the new construction as noted.
6. Verify all dimensions in the field prior to fabrication of any items.
7. Contractor must supply all submittals upon notice to proceed to maintain the project schedule as intended.
8. Coordinate any embeds, rebar, electrical boxes, hose bibs, beam pockets, etc with other Bid Packages. Contractor will not be compensated for rework to due to failure to coordinate with other trades. Failure to report discrepancies prior to start of work will exclude contractor from any future compensation for remedial work.
9. Per the schedule in the contract documents there will be a Construction Manager punch list as well as an Owner/Architect/Engineer punch list. Contractor to include mobilizations as needed for punch list corrections.
10. This bid package shall include multiple mobilizations to meet the schedule.
11. Provide all required traffic control for installation of work.
12. Provide all surveying, staking, and layout needed for this scope of work.

13. Provide temporary power and water for this scope of work if other permanent or temporary power and water are not readily available at the jobsite.
14. This Bid Package to apply and maintain all applicable permits.
15. Include full depth saw-cutting and grading at existing driveway / parking lot pavement to join new paving to existing paving as indicated in the Contract Documents. Shall include a second cut before new paving is placed to remove chipped edges from first cut.
16. Include hand removal, shoring, and protection to expose any adjacent existing building structure as needed.
17. Clean streets and roadways to keep them free of dirt, mud and debris generated by this scope of work. Clean daily or more often as site conditions require.
18. Provide daily jobsite clean-up. Haul and place all debris unrelated to the demo of the helipad to the jobsite dumpster.
19. A concrete wash-out container for use by this Bid Package to be provided by this Bid Package. Concrete wash out to be off-site or on-site concrete wash out container to be emptied off site. Any other means of concrete wash out to be approved by Construction Manager.
20. Concrete waste created by this Bid Package shall be removed from the site by this Bid Package. Concrete waste cannot be placed in the dumpster provide by the Construction Manager.
21. Furnish and install joint sealant at paving and sidewalks and include sealant where concrete poured by this bid package meets any dissimilar material.
22. Furnish and install all pavement markings, traffic signs, handicap parking signs, etc. as indicated in the contract documents. Scope includes the repair of existing pavement markings damaged due to concrete repairs. Striping repair to be completed from curb to curb or the full extent of the marking.
23. Power washing and cleaning of the helipad may be required before applying pavement markings. This cost will be included in this bid package.
24. Provide all labor and equipment for puddling of concrete.
25. Slope slab on grade to drains as outlined on the drawings. The required thickness for the slab on grade or slab on deck must be maintained.
26. Furnish and install all reinforcement including welded wire fabric and any macro/microfibers, dosage rate to be confirmed with Engineer and Manufacturer. All reinforcement must be inspected by testing agent. Coordinate with the testing agent and construction Manager.
27. Miscellaneous embeds, anchor bolts, and dowls to be provided and installed by this package.
28. Clean-up concrete debris, splatter, etc. at all building components.
29. Provide all depressions shown or required in the contract documents.
30. Provide proper FF & FL and sloping per the contract documents.
31. Coordinate concrete sloping around all floor drains with Mechanical / Plumbing Bid Package and Construction Manager.

32. Furnish and install block outs for expansion joint covers in floor slabs and poured concrete walls as indicated in the Contract Documents. Coordinate this work with other bid packages.
33. Review Mechanical and Electrical Drawings to patch existing floors where floor slab work has been completed.
34. Provide all misc. concrete patching noted in the Contract Documents.
35. Provide, inventory and install anchor bolts, embeds, base plates, leveling plates, angles, reglets, metal expansion joint assemblies, etc. Prime Contractor shall report all damaged items or shortages upon finalization of receipt and inventory. Shortages or replacement of items due to loss or damage that can be attributed to Prime Contractor lack of care or management will be the responsibility of the Prime Contractor.
36. Monitor concrete placement and adjust/maintain positioning of reinforcing during pours.
37. Rub, fill, grind, and patch as necessary to prepare surfaces for specified finishes or as necessary to achieve specified tolerances. Patch all exposed form tie holes immediately following stripping operations.

Project Specific Requirements

38. This package is responsible for the removal of all demolished materials from the jobsite. The jobsite dumpsters are not to be used for concrete debris removal. This is assumed to be done via truck or dedicated dumpster and displaced to an appropriate location offsite.
39. This package to remove and reinstall the metal grating and threshold at the entrance to the hospital.
40. This package is responsible for any measures to ensure the protection of all roofing materials in place during the demolition of the helipad and walkway. If the roofing is damaged due to this scope of work, then the repair, replacement, and incidental expenses will be at the cost of this package.
41. This package to supply the installation of the sub-slab insulation for the helipad
42. This package to supply all of the sub-concrete weatherproofing and roof system related components including insulation, roofing, bentonite goods, etc. as shown in the drawings.
- 43. This package to provide an allowance of \$10,000 for the replacement of the existing bentonite waterproofing and existing bentonite granules and drainage layer under the helicopter pad.**
44. This package is responsible for the application of Salt-Guard Product
45. This package is responsible for supplying the layout of the helipad and walk-way extents for the roofer to install the insulation and roofing components. This will be assumed to be a separate mobilization.
46. This package is responsible for all of the saw cutting, backer rod, joint sealants, and adhesives as shown in the contract drawings for all adjoining surfaces including the concrete next to the permanent structure.

47. This package is responsible for all of the helipad paint as required per the contract documents. Please review and coordinate with cure times and product applications to ensure longevity and warranty.
48. This package is to include all necessary tools and equipment for the hoisting and removal of materials as it pertains to your scope of work.
- a. There will not be equipment provided on site to complete this. This package is responsible for supplying equipment and qualified operators to ensure timely and safe operation.
 - b. If this package would like to use equipment to assist with the demolition of materials from the roof – that information must be sent to the Construction Manager for approval by the Engineer of Record.
49. This package to coordinate the routing of all MEP components of the in-slab radiant heat, electrical, sensors, etc. as it applies to the work, concrete reinforcing, and forms as it applies to this scope of work.
50. This package to review and install the concrete joint layout per the drawings as indicated.
51. This package to include the forming and finishing of concrete to ensure the complete installation of all systems as indicated, including the cubs, and chamfering as noted.
52. The Prime Contractor agrees to the following unit/alternate prices, which include all delivery, hoisting, supervision, fringes, equipment, travel time, insurance, taxes, bonds, overhead and profit for the Work if ordered in writing by the Construction Manager. Provide Unit Prices per Bid Breakdown including all mark ups:
- A. Slab-on-Grade: \$ _____/sf
 - B. Survey Crew \$ _____/Hr
 - C. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.
 - D. Provide a list of billable tool/equipment rates for change order work including subcontractors.

Company Information:

Bidder's Company Name

Telephone Number

Date of Proposal

Fax Number

Helipad & Roof Replacement
Boone County Hospital
INVISION #24003

SITE, PIERS, CONCRETE

Signature

Printed Name

END OF SECTION 00 80 02

SECTION 00 80 02 – BID PACKAGE #02
Bid Package 02: Roofing

Furnish all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shop drawings, field measurements, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all mobilizations, phasing, shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule.

This bid package includes, but is not limited to the following scope of work:

1. Bid Package #00 – General Requirements
2. Plans by INVISION dated June 14th, 2024.
3. This Bid Package includes, but is not limited to the following scope of work:
 - a. Specifications from the Project Manual by InVision, dated June 14th, 2024 including, but not limited to the following sections:
 - i. All Division 00 and 01 specifications
 - ii. 06 10 00 Rough Carpentry (as applicable)
 - iii. 07 01 50.19 Preparation for Re-Roofing
 - iv. 07 14 19 Fluid Applied Waterproofing
 - v. 07 19 00 Water Repellents
 - vi. 07 21 00 Thermal Insulation
 - vii. 07 24 00 Exterior Insulation and Finish Systems (as applicable)
 - viii. 07 54 00 Thermoplastic Membrane Roofing
 - ix. 07 62 00 Sheet Metal Flashing and Trim
 - x. 07 71 00 Roof Specialties
 - xi. 07 92 00 Joint Sealants
4. The below items are further clarifications and/or additional requirements to the above specification sections.
5. Contractor shall furnish and install complete roofing system as designed in the Contract Documents. Bid Package pricing shall align with inclusions and exclusions as outlined in this document, this includes but not limited to; insulation, membrane, flashings, termination bars, penetration seals, curb detailing, roof hatches, scuppers, adhesives, fasteners, and any appurtenances for complete system.
6. Contractor must supply all submittals upon notice to proceed in order to maintain the project schedule as intended.
7. Contractor shall familiarize themselves with architectural layout of cricket, tapers, and roof drains shown in Contract Documents, and shall provide shop drawings of actual tapers and build-up of roofing materials to verify required slope per the Contract Documents.
8. Include additional roof penetration flashings for roof mounted equipment items such as vent piping, exhaust fans, mechanical items, mounts for solar array. Contractor shall familiarize themselves with the roof mounted equipment with the required penetrations and curb detailing for such equipment.

9. Contractor shall provide and install rubber walkway pads as outlined in the Contract Documents.
10. Contractor shall provide and install all coping cap at parapets, along with weather seal, and misc. counter-flashings. Contractor shall coordinate color and finish of metals as noted in the Contract Documents and to match building design elements.
11. All roof penetrations may not be ready at the time of roof installation. Provide 3 additional mobilizations to flash roof penetrations after the main roofing has been completed.
12. This Bid Package is responsible for all hoisting of materials related to this package. Materials on roof are to be secured daily.
13. Provide all layouts as required to complete this scope of work. This Bid Package is to field verify all dimensions prior to fabrication of products.
14. Contractor shall include safe access to and from the roof for the duration required for roofing install.
15. Provide and install all expansion joints if required by manufacturer's recommendations.
16. Provide all caulking as needed for roof flashing or any materials supplied by this Bid Package. Include all caulking from flashings to metal panels and flashing to other dissimilar materials.
17. Contractor shall enclose and detail all curbs, boots, and all penetrations for mechanical and electrical as noted in the Contract Documents.
18. Contractor shall provide all submittals, product data, shop drawings, and documents as required by the Construction Documents.
19. Contractor shall provide specific warranties as identified in Contract Documents.
20. Safety
 - a. Contractor shall provide, maintain, and remove a temporary Warning Line System 15' from the edge of the roof around the entire helipad rooftop perimeter. This system shall meet all requirements of OSHA regulations especially 1926.502 10. Install this warning line system at the commencement of work. The warning line system shall be maintained by this Bid Package until 10 days after substantial completion (or before this date as directed by the Construction Manager). This warning lined to be utilized by all trades on the jobsite.
 - i. Contractor to ensure appropriate entrances and exits at stair tower, trash chute, and other means of entrance, egress, and disposal.
 - ii. Work outside of established warning line will require 100% fall protection. Any tie-off equipment shall be provided by Contractor not Construction Manager
21. This package to exclude providing/installing any ladders.

Project Specific Requirements

22. This package to provide the complete removal and replacement of all roofing components.
 - a. This package must haul off roofing components separate from the jobsite dumpsters provided, and must plan to clean, remove, and haul off at the end of each workday to ensure no remaining debris is left.
 - b. This to include the removal and disposal of all pavers as applicable.
23. This package is responsible of ensuring that the roofing removal is phased as to be weather tight at the end of each work day.
24. This package to make note of, and adhere to detail 1/A5.01 to ensure warrantable roofing condition.
25. This package to include the removal and patch-back of the curbs as noted.
26. This package to review the roof penetrations on the MEP, Architectural, and Structural drawings to develop an understanding of the number of penetrations as required to complete this scope.
27. This package to supply the roof walkway pads as indicated on A1.31
28. This package to plan for multiple mobilizations including the removal of the existing roofing, the replacement of the roofing including all components under the helipad, and the final tie-in and roofing of the remainder of the roof.
29. This package is to include all necessary tools and equipment for the hoisting and removal of materials as it pertains to your scope of work.
 - a. There will not be equipment provided on site to complete this. This package is responsible for supplying equipment and qualified operators to ensure timely and safe operation.
30. This contractor to review safety requirements above. This package to supply flagging around the entire scope of work for the use of all trades.
31. This contractor to supply a stair-tower that is to be regularly inspected for use by all trades for the full duration of the construction project.
32. This package to supply all new components as required by contract drawings, including but not limited to membrane, adhesives, fasteners, termination bars, and other roofing accessories.
- 33. This package to supply an allowance of \$12,000 for the removal and replacement of form roofing if found to have been further deteriorated beyond covering.**

34. Provide unit prices for the following items:

1. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.
2. Provide a list of billable tool/equipment rates for change order work including subcontractors.

Alternates: Provide pricing on Bid Form for all applicable alternates as defined in Specifications

Company Information:

Bidder's Company Name

Telephone Number

Date of Proposal

Fax Number

Signature

Printed Name

END OF SECTION

SECTION 00 80 03 – BID PACKAGE #03
Bid Package 03: Plumbing, HVAC, Electrical, Lighting

Furnish complete all necessary labor, materials, office and field supervision, insurance, tools, equipment, layout, hoisting, rigging, shoring, shop drawings, submittals, permits, licenses and fees necessary to complete the work outlined below. Include all shift pay, overtime, weekend and holiday pay to complete the work in the scheduled durations shown in the project schedule in Specification Section 01 15 20.

This Bid Package includes, but is not limited to the following scope of work:

1. Bid Package #00 – General Requirements
2. Plans by INVISION dated June 14th, 2024
3. Specifications from the Project Manual by INVISION, dated June 14th, 2024 including, but not limited to the following sections:
 - a. All Division 00 and 01 specifications
 - b. Division 07 – Thermal and Moisture Protection (as applicable)
 - c. Division 22 – Plumbing
 - d. Division 23 – Heating, Ventilation and Air Conditioning (HVAC)
 - e. Division 26 - Electrical
4. The below items are further clarifications and/or additional requirements to the above specification sections.
5. Provide complete demolition of all plumbing, mechanical, electrical and HVAC systems per plans and specifications. Any items not specifically shown or listed in the contract documents but are required to be removed or relocated for this contractor's or other trade's work or as required by code shall be included.
6. If this bid packages removes any ceiling tile or grid for above ceiling work, they are responsible to replace it. Tile and grid should be clean and damage free.
7. Furnish and install complete plumbing, mechanical, electrical, and HVAC, systems per plans and specification sections listed above and as indicated in the Contract Documents. Contractor is responsible to review Architectural, Structural, and Civil drawing sheets for coordination and any mechanical items not identified on the MEP drawing sheets.
8. Mechanical contractor to include all necessary core drilling through walls and floors as required to complete their scope of work.
9. This package is responsible for all patching as applicable to their scope of work.
10. Provide and install all housekeeping pads
11. Coordinate with the other trade contractors on rough-ins and final connections
12. Obtain and pay for the plumbing/mechanical building permit for specification sections noted above. Construction Manager to obtain building permit.

13. Contractor to be adequately qualified to perform work in a healthcare environment as outlined below:
 - a. Contractor has completed similar healthcare projects in the past three years.
 - b. Contractor will have an after hours/24-hour emergency service under the entire contract and warranty period.
 - c. Contractor will have sufficient manpower to staff the project to meet the project schedule outlined in Specification Section 01 10 00.
 - d. Field and office management/supervisors must have a minimum of three years of healthcare experience.
14. The owner has salvage rights to any materials being removed / demolished for the construction of this project. Any materials the owner does not want to retain will be removed as noted by the contract documents.
15. Furnish and install all roof curbs for pipe and duct penetrations as indicated on the Contract Documents.
16. Protect all ductwork and piping from water, oil, dust and other contaminants after delivery to the jobsite. Store off the floor. Cover ends of pipe and ductwork delivered and stored at the jobsite. Installed ductwork and medical gas piping ends shall remain covered until the adjacent piece is installed. Clean ductwork as it is being installed if necessary. Clean ductwork upon completion per specifications or provide a written clean-duct protocol for the project, subject to review and approval.
17. This Contractor and main Subcontractors will be required to sit in and participate in up to 3 coordination meetings.
18. Coordinate shop drawings and installation of the work in this bid package with other trade contractors to maximize the free space. All work shall be installed so as to provide the maximum benefit to the Owner and allow for full access to equipment requiring maintenance.
19. Provide electronic coordination drawings, shop drawings and as-built drawings as required for this project. Drawings to be sent to the electrical contractors for coordination.
20. Provide phasing and additional mobilizations as needed to meet the schedule. Where sprinklers are added in existing areas, upgrade any existing sprinkler zones as needed and as determined by the design by this Contractor.
21. This Bid Package is responsible for demolition and removal of any and all existing concrete slab on grade and slab on deck required to be removed for this Bid Package's work at any location.
22. Furnish and install all roof curbs for roof top mechanical equipment.
23. Install temporary drain piping (flexible) to roof drains as needed to avoid storm water from dumping inside the building after the roof membrane has been installed and before the permanent roof drain piping has been installed.
24. Adjust or raise all storm drains as indicated on the contract drawings to properly reach adjacent surfaces.
25. At no time shall the Hospital be without essential services (electricity—both normal and generator power, gas, water, hot water, chilled water, steam, med gas, heating and cooling, etc. All interruptions to these services to be coordinated with the Construction Manager.

26. Provide and patch / fire caulk as needed for any penetrations required by this Bid Package. Also patch any openings made by this Bid Package as needed for penetrations in existing walls, floors, and ceilings. Patch abandoned Mechanical shafts, chases, penetrations with approved UL design.
27. Any penetrations at existing construction made by this Bid Package need to be sealed watertight and/or fire stopped as required.
28. For any combustion equipment used for temporary heating, provide scrubbers on the equipment.
29. Provide mechanical connections for any equipment Owner supplied or otherwise noted on the Contract Documents and on the Owner supplied equipment cut sheets.
30. Contractor is responsible to review Architectural, Structural, Plumbing, and Mechanical drawing sheets for coordination of sprinkler lines and head locations as to not conflict with other systems.
31. Provide additional material and labor for a two phase connection of the sanitary sewer and water main on the west side of hospital.

Electrical and Low Voltage

32. Provide complete demolition of all electrical systems per plans and specifications. Any items not specifically shown or listed in the contract documents but are required to be removed for this contractor's or other trade's work or as required by code shall be included.
33. If this bid packages removes any ceiling tile or grid for above ceiling work, they are responsible to replace it. Tile and grid should be clean and damage free.
34. Furnish and install a complete electrical system per specification sections listed above and as indicated in the Contract Documents. Contractor is responsible to review Architectural, Structural, and Civil drawing sheets as applicable for coordination and any mechanical items not identified on the MEP drawing sheets. Refer to the responsibility matrix provided in the contract documents for Contractor responsibility of owner provided items.
35. Provide all required electrical systems and connections for equipment as shown on the contract documents.
36. Provide all electrical demolition, disconnection of power, phone, and data as required for project demolition and construction. Coordinate work with other trades demolition contractors and Construction Manager.
37. The owner has salvage rights to any materials being removed / demolished for the construction of this project. Any materials the owner does not want to retain will be removed as noted by the contract documents or as needed for construction. Coordinate with Owner and Construction Manager for Owner removal of copper wiring.
38. Obtain and pay for the electrical building permit through the City of Boone. General building permit will be obtained by the Construction Manager.
39. This Contractor and main Subcontractors will be required to sit in and participate in up to 2 coordination meetings (above and beyond regularly scheduled progress meetings) to coordinate rough-ins.

40. Provide electronic documents as needed for coordination drawings, shop drawings and as-built drawings for this project. Drawings to be sent to CM for coordination.
41. Provides conduit, wiring & in-wall rough-in of all back boxes as applicable.
42. Coordinate the outlets and switches to be compliant with OSHA. Power needs turned off to these outlets when the switch plates and outlet plates are removed for painting. If the power cannot be turned off (e.g. breaker run adjacent hospital room that cannot be shutoff) provide alternate plates to allow finish paint to be finished beyond the edge of the cover plate outlines.
43. Provide and install all required housekeeping pads
44. Coordinate with Mechanical Contractor on wiring and power requirements for mechanical equipment

Project Specific Requirements

45. This package will be responsible for the patching of EIFS as shown on the plans.
 - a. This package to ensure that all penetrations are properly sealed and finished to ensure continuous barrier is maintained.
 - b. This package also to include refinishing as applicable for an architecturally acceptable final finish. Package to coordinate final condition with CM and Architect.
46. This package is to include all necessary tools and equipment for the hoisting and removal of materials as it pertains to your scope of work.
 - a. There will not be equipment provided on site to complete this. This package is responsible for supplying equipment and qualified operators to ensure timely and safe operation.
47. This package is responsible for the protection of all MEPT components during construction
48. This package is responsible for providing all painted steel stands, mounting equipment, and similar structures for the support of all MEPT components.
49. This package is responsible for rebalancing.
50. This package is responsible for all project specific keynotes as indicated in the drawing. Please refer to M1.0 specifically for more information.
51. This contractor is responsible for the coordination of the in-slab sensors with the Concrete Contractor. This will be assumed to be a separate mobilization to ensure the timely installation
52. This contractor is responsible for all sleeves necessary to complete scope of work through walls, and other surfaces.
53. This package will be responsible for the installation of all new lighting
- 54. This package is to include a \$5,000 allowance for the investigation and replacement of existing lighting issues that are to remain per the contractual drawings.**

Include additional description as needed to correlate with spec sections added above

Provide unit prices for the following items:

1. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.
2. Provide a list of billable tool/equipment rates for change order work including subcontractors.

Alternates: Provide pricing on Bid Form for all applicable alternates as defined in Specifications.

Provide unit prices for the following items:

3. Provide a list of hourly labor rates for change order work including subcontractors working under the prime contractor. Include overtime rates.
4. Provide a list of billable tool/equipment rates for change order work including subcontractors.

Alternates: Provide pricing on Bid Form for all applicable alternates as defined in Specifications.

Company Information:

Bidder's Company Name

Telephone Number

Date of Proposal

Fax Number

Signature

Printed Name

END OF SECTION 00 80 05

Helipad & Roof Replacement
Boone County Hospital
INVISION #24003

PLUMBING/HVAC/FIRE/SPRINKLER

00 80 03

SECTION 00 9000 – EXISTING HAZARDOUS MATERIAL INFORMATION

ARTICLE 1 – EXISTING HAZARDOUS MATERIAL

1.1 Existing Hazardous Material Information

- A. Document 00 1200 "Invitation to Bid" for the Bidder's responsibilities for examination of Project site and existing conditions. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. The work area will be tested for asbestos containing material. If any suspect material is encountered during the course of construction contact the Construction Manager immediately.
- C. No inspections or reports are available for lead, PCB (Polychlorinate Biphenyl), existing mold and mildew, or other potential Hazardous materials.
- D. Related Requirements:
 - 1. Document 00 1200 "Invitation to Bid" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF SECTION 00 9000

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: BCH Helipad
- B. Owner's Name: Boone County Hospital.
- C. Architect's Name: INVISION Architecture.

1.02 DESCRIPTION OF WORK

- A. Scope of demolition and removal work is shown on drawings and specified in Section 02 41 00.
- B. Scope of alterations and new construction work is shown on drawings.
- C. Services (Including but not limited to Plumbing, HVAC, Electrical Power and Lighting, Fire Protection, Telecommunications, and Security): Alter existing system and add new construction, keeping existing in operation.
- D. Owner will remove the following items before start of work:
 - 1. Furnishings.
 - 2. Artwork.
 - 3. Portable medical equipment.
- E. Contractor is required to remove and deliver the following to Owner prior to start of work:
 - 1. Items as indicated in Demolition Drawings.
 - 2. Additional items identified during Pre-Demolition walk-through with Owner.
- F. Contractor is required to remove and store the following prior to start of work, for later reinstallation by Contractor:
 - 1. Items as indicated in Demolition Drawings.
 - 2. Additional items identified during Pre-Demolition walk-through with Owner.

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner (OFOI) after Substantial Completion. Some items include:
 - 1. Signage.

1.04 OWNER-FURNISHED ITEMS

- A. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.
- B. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.
- C. If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.
- D. The Contractor is responsible for designating the delivery dates of Owner furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site.
- E. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.

1.05 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

1. Notify Project Coordinator and Owner regarding scope of work causing vibrations that could impact function of spaces below.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:

1. Owner occupancy.
2. Work by Others.
3. Work by Owner.
4. Use of site and premises by the public.
5. Adjacent building and/or tenant operations.

C. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.
3. Alternative entrances, exits and Interim life safety procedures will be required if the main entrance or any fire exits are closed during construction. Coordinate durations with Owner.

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

E. Time Restrictions:

1. As defined by Project Coordinator.
2. Limit conduct of especially noisy work or work causing vibrations to hours as approved by Owner.

F. Utility Outages and Shutdown:

1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
2. Limit shutdown of utility services to the hours as arranged with Owner by the Project Coordinator.
3. Prevent accidental disruption of utility services to facilities.

1.07 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner and Project Coordinator.

B. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

C. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

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

E. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming Work, provide openings for penetrations of existing surfaces, and provide samples for testing if required. Seal penetrations through floors, walls, and roof.

1.08 DEFINITIONS AND EXPLANATIONS

- A. Imperative language is used generally in the specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor as if preceded by the phrase "The Contractor shall".
- B. The term "provide" means furnish and install, complete, and ready for intended use. Except as otherwise defined in greater detail, the term "furnish" means supply and deliver to the project site, including unloading, unpacking, inspecting, and storing until ready for receipt by Owner, installation, etc., as applicable.
- C. Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable.
- D. The term "indicated" is as cross-reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shows", "noted", "schedules", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitations of location is intended.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1520 – PROJECT BID SCHEDULE

- A. The following is the project bid schedule. Each Contractor shall review the schedule carefully and include in their bid any shift premiums or overtime required to complete their work in the duration shown. Work that is not completed on schedule may be completed by the Owner or Owner's Agents by whatever means necessary and the cost for such work will be subtracted from the Contractors contract sum.
- B. The project bid schedule is intended to show general flow of work. It is not intended to show all activities or durations as that detail will be developed with contractor input upon award.
- C. Each prime contractor should note the project is expected to be staffed at a minimum of Monday through Friday 7:00 a.m. to 4:30 p.m. of each week while performing the scope of work relevant to their contract. A minimum of one representative from each company must be on site during that time. Contractor acknowledges working in the hospital environment will likely require off hour work to minimize the impact to the hospital and has included those costs in their bid.
- D. Deliveries will be coordinated off hours as necessary to minimize the impact to hospital operations. These deliveries will be outside the typical work hours noted above.
- E. Any schedule delays will need to be documented within 10 business days of the delay. The Owner may elect to allow additional time. If allowed, this will be at no additional cost to the Owner.

END OF SECTION 01 1520

SEE ATTACHMENT:
SECTION 01 1520.01 – PROJECT BID SCHEDULE

Boone County Hospital Helipad and Roofing Renovation

Schedule Updated:
Wed 6/12/24

ID	Task Name	Duration	Start	Finish	Schedule																								
					5/19	5/26	6/2	6/9	6/16	6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	9/29	10/6	10/13	10/20	10/27	11/3
1	Project Schedule	99 days	Fri 6/14/24	Fri 11/1/24	Project Schedule																								
9	Pre-Construction	30 days	Fri 6/14/24	Fri 7/26/24	Pre-Construction																								
10	Public Bidding Window	12 days	Fri 6/14/24	Mon 7/1/24	Public Bidding Window																								
11	Bid Day	1 day	Tue 7/2/24	Tue 7/2/24	Bid Day																								
12	Board Approval	7 days	Wed 7/3/24	Fri 7/12/24	Board Approval																								
13	Notices to Proceed Distributed and Signed	5 days	Mon 7/15/24	Fri 7/19/24	Notices to Proceed Distributed and Signed																								
14	Submittal Review Timframe	5 days	Mon 7/22/24	Fri 7/26/24	Submittal Review Timframe																								
2	Key Milestones	87 days	Tue 7/2/24	Fri 11/1/24	Key Milestones																								
3	Bid Day	1 day	Tue 7/2/24	Tue 7/2/24	Bid Day																								
4	Substantial Completion	0 days	Fri 11/1/24	Fri 11/1/24	Substantial Completion																								
5	Procurement	20 days	Mon 7/29/24	Fri 8/23/24	Procurement																								
6	Roofing Membrane	4 wks	Mon 7/29/24	Fri 8/23/24	Roofing Membrane																								
7	Roofing Adhesives and Fasteners	4 wks	Mon 7/29/24	Fri 8/23/24	Roofing Adhesives and Fasteners																								
8	Radiant Heat Components	4 wks	Mon 7/29/24	Fri 8/23/24	Radiant Heat Components																								
15	Construction	64 days	Mon 8/5/24	Fri 11/1/24	Construction																								
22	Site Mobilization & Setup	2 days	Mon 8/5/24	Tue 8/6/24	Site Mobilization & Setup																								
24	Fall Protection & Stair Tower	2 days	Wed 8/7/24	Thu 8/8/24	Fall Protection & Stair Tower																								
25	Remove MEP Components	2 days	Fri 8/9/24	Mon 8/12/24	Remove MEP Components																								
26	Remove Roofing Pavers	5 days	Tue 8/13/24	Mon 8/19/24	Remove Roofing Pavers																								

**SECTION 01 21 00
ALLOWANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts.
- B. Architect Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- C. Contractor Responsibilities:
 - 1. Assist Architect in selection of products, suppliers, and installers.
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- D. Differences in costs will be adjusted by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. Section 07 54 00 - Thermoplastic Membrane Roofing: Include the stipulated sum of \$12,000.00 for purchase, delivery, and installation of additional rigid insulation.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 23 00
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Sum and Contract Time.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

- A. Alternate #1: After-Hours Work
 - 1. Base Bid: Work during normal business hours as noted in the specifications. Emergency cases from the Emergency Department may necessitate a short pause to allow the use of the CT machine during demolition work.
 - 2. Alternate: Provide alternate pricing to complete the concrete demolition scope between the hours of 4:00pm - 10:00pm and regular working hours on Saturday and Sunday. Emergency cases from the Emergency Department may necessitate a short pause to allow the use of the CT machine during demolition work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Coordination drawings.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Requests for Information (RFI) procedures.
- I. Submittal procedures.
- J. Release of CAD/BIM files.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Dates for applications for payment.
- B. Section 00 72 00 - General Conditions: Duties of the Construction Manager.
- C. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- D. Section 01 60 00 - Product Requirements: General product requirements.
- E. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- F. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

1.04 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site and existing building access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
 - 1. An electronic document submittal service will be utilized.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Information.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.

4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. The web-based software will provide status logs, reports, searching and automated notifications.
 2. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 3. Contractor and Architect are required to use this service.
 4. It is Contractor's responsibility to submit documents in allowable format.
 5. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 6. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 7. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 8. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts, which shall be delivered by mail or courier.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: The selected service is:
 1. ProCore Construction Management Software; <https://app.procore.com/account/login>.
- D. Training: will be arranged for subcontractors upon request.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 RELEASE OF CAD/BIM FILES

- A. Contractors may request plans for their use/benefit for assistance in preparing submittals or for use in construction.
 1. The Revit model will be provided at no charge.
 2. If CAD files, contractor shall identify specific sheets to be produced as files.
 - a. A one-time charge for producing the files will be requested.
 3. A signed release form is required.

- a. See form immediately following this section.

3.03 PRECONSTRUCTION MEETING

- A. Project Coordinator will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. Owner.
 2. Architect.
 3. Contractor.
 4. Major subcontractors.
- C. Agenda:
 1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of initial Submittal schedule.
 6. Designation of personnel representing the parties to Contract, the Owner's Representative and Architect.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Scheduling.
 9. Scheduling activities of third party inspections and testing.
- D. Project Coordinator will record minutes and distribute copies within 7 days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.
 1. Minutes will be distributed through Web-based project management software system.

3.04 PROGRESS MEETINGS

- A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
 1. Contractor.
 2. Owner.
 3. Architect.
 4. Special consultants.
 5. Contractor's superintendent.
 6. Major subcontractors.
 7. Major Suppliers.
 8. Additional consultants, subcontractors, suppliers and product representatives as appropriate to agenda topics for each meeting.
- C. Agenda:
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.

12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- D. Project Coordinator will record minutes and distribute copies within 5 days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.
1. Minutes will be distributed through Web based project management software system

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

3.06 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare in a format and with content acceptable to Owner.
 3. Prepare using software provided by the Electronic Document Submittal Service.
 4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

- a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 - 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 - 2. Owner's, Architect's, and Contractor's names.
 - 3. Discrete and consecutive RFI number, and descriptive subject/title.
 - 4. Issue date, and requested reply date.
 - 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 - 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 - 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Maintain and print "hard copy" reports for progress meeting. Reports to contain:
 - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 - 2. Note dates of when each request is made, and when a response is received.
 - 3. Highlight items requiring priority or expedited response.
 - 4. Highlight items for which a timely response has not been received to date.
 - 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 - 1. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 - 2. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 - 3. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
 - 2. Coordinate with Contractor's construction schedule and schedule of values.
 - 3. Format schedule to allow tracking of status of submittals throughout duration of construction.

4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
 5. Other types indicated.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
 1. Transmit to Architect/ Engineer via email to Project Coordinator or via Electronic Document Submittal Service.
- B. Extra Copies at Project Closeout: See Section 01 78 00.

- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a single transmittal for related items.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use form generated by Electronic Document Submittal Service software.
 - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - 7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
 - 8. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 15 days.
 - 9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 10. Provide space for Contractor and Architect review stamps.
 - 11. When revised for resubmission, identify all changes made since previous submission.
 - 12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 - 14. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 - 2. Do not reproduce Contract Documents to create shop drawings.
 - 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
 - 1. Transmit related items together as single package.
 - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.14 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Reviewed", or language with same legal meaning.
 - b. "Make Corrections Noted", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - 2) Non-responsive resubmittals may be rejected.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

REVIT MODEL RELEASE FORM

PROJECT	Helipad & Roof Replacement	PROJECT #	24003
OWNER	Boone County Hospital	DATE	Click here to enter text.

INVISION Architecture is allowing the below signed Contractor to use the project architectural Revit Model, architect's current version, prepared by INVISION Architecture, solely for the purpose of producing shop drawings as required for this project. INVISION does not guarantee the compatibility of the model file with any hardware or software, nor does INVISION make any representation as to the accuracy or completeness of the information contained therein. Since the information in the model can be modified, INVISION requires the removal of all title block information and seals belonging to INVISION or any professional consultants.

The Contractor shall understand that this model is for their company's use to prepare shop drawings for this project only. These drawings are instruments of service and shall not be reproduced in any way, shape or form other than for submittals specifically for this project. Any other use is strictly prohibited by copyright law. The user of this electronic model file assumes full responsibility for the accuracy and scale. Any verification required shall be the sole responsibility of the Contractor. Further, the Revit Model includes proprietary information, and the Contractor shall not copy or otherwise appropriate for their own use or distribution any model families or components from the model.

The Contractor shall, to the fullest extent permitted by law, indemnify, defend and hold harmless INVISION and its subconsultants from all claims, damages, losses and expenses, penalties, and liabilities of any kind, including attorney's fees and expenses, arising out of or resulting from the use of the Revit model files by the Contractor, or by any third-party recipients of the CAD files from the Contractor.

The model will be provided at no cost, unless significant preparation is required. If required, the cost of preparation will be identified and due prior to model release.
This agreement shall be governed by the laws of the State of Iowa.

Sincerely,

Shannon Swift, AIA
INVISION Architecture

Contractor's Company Name	Name and Title of Contractor's Representative
---------------------------	---

Contractor's Signature	Date
------------------------	------

SECTION 01 3500 - HOSPITAL DUST CONTROL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. The hospital facilities are and will be acutely sensitive to dust and associated contaminants. The following processes are required for the work:
 - 1. Protection to the Building operations from the migration of contaminants out of construction areas and into active portions of the facility.
 - 2. Design, labor, materials, equipment, and incidental expense necessary to accomplish the intent of these specifications.
 - 3. Special Ductwork Requirements.
 - 4. HVAC filter changes.
- B. Related Sections:
 - 1. Section 01 3520 – SPECIAL PROJECT PROCEDURES.
- C. Systems:
 - 1. The type of barrier required will vary with the space being adjacent to the work area, though all barriers shall be kept tight for the purpose intended.
 - 2. Operations including movement of materials outside the work area but inside the facility are subject to dust control requirements as directed by Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Construction separators, partitions exposed to public view or fire-rated partitions specified elsewhere.
- B. For other locations, materials generally used:
 - 1. Wood Standard Frames.
 - 2. Polyethylene Film: 6 mil, reinforced.
 - 3. Pressure Sensitive Poly-Film for joining film.
 - 4. Caulking or compressible foam seals for joints around perimeter of partition.
 - 5. Plywood: ½" CD minimum for wainscot and temporary doors.
 - 6. Studs: Wood or metal.
- C. Equipment:
 - 1. Minimum: collection device with bag filter and particle separator.
 - 2. Other: As required to comply with requirements of the Section.
- D. Filters
 - 1. For Permanent Air Handling Equipment: As specified under Division 15.
 - 2. Return Air Intakes: Media type filters, acceptable to Architect and Owner.
 - 3. Supply Air Discharges: As specified under Division 15.

PART 3 – EXECUTION

3.01 DESIGN

- A. The Contractor shall bear responsibility of all design of the barriers and source dust control. Barrier design source dust control is subject to Owner review and approval and subsequent correction and resubmission, if required.
- B. All materials and equipment selected are subject to Owner's approval and only general types are

included herein for reference.

- C. Collect dust as produced by work.
- D. Vent air from area to prevent dust from entering occupied portions of building and HVAC system.

3.02 ERECTION

- A. The barriers shall be quickly and neatly prepared before other work is performed on the project.
- B. All barriers shall be immediately repaired when damaged by the Contractor's personnel, and the cost of such repairs shall be borne by the Contractor.
- C. Upon completion of the project, remove all barriers from premises and restore the area to its original condition.

3.03 FILTER CHANGES

- A. HVAC Contractor: Responsible to keep all filters changed for both temporary and permanent equipment and openings.
- B. Normal Schedule Changes: Change filters at not less than the following intervals:
 - 1. Permanent Air Handling Equipment: Monthly
 - 2. Return Air Intakes: Weekly
 - 3. Supply Air Discharges: Monthly
 - 4. Other Locations: As required to safeguard cleanliness of HVAC system.
- C. Unscheduled Changes: In addition to schedule changes, provide additional filter changes when filters become sufficiently dirty to prevent efficient equipment operation or jeopardize the cleanliness of ductwork.
- D. Costs: cost of filter changes borne as follows:
 - 1. HVAC Contractor: All costs associated with normal schedule changes.
 - 2. General Contractor: Unscheduled changes, as an indicator that his efforts of local source dust control are inadequate.
- E. Contractor's Option: At areas where equipment does not service area outside the construction zone, filter changes shall be as required to maintain equipment and ductwork cleanliness achieved by the criteria above. Architect reserves the right to require inspection ports be installed at no additional cost; if he believes the Contractor is not achieving the desired result.
 - 1. Cleanliness Failure:
 - a. Ductwork: As described above.
 - b. Equipment: As desired by the Architect at no increased cost to Owner.

3.04 PROTECTION, MAINTENANCE AND REMOVAL

- A. Protect all existing elements in work area from damage and dust.
- B. Maintain all dust control devices and measures in effective condition.
- C. Remove all control devices and materials at completion of job or when required for completion of work. Earlier removal subject to approval of Architect.

END OF SECTION 01 3500

SECTION 01 3520 – SPECIAL PROJECT PROCEDURES

PART1 – GENERAL

1.01 SECTION INCLUDES

SPECIAL NOTE: This specification section will be used for any work that must be performed after the owner takes occupancy of the building, and all work performed within or near the existing hospital.

- A. Procedures for Work in an Operational Hospital.

1.02 GENERAL

- A. The existing hospital is a fully functioning facility. During construction of the new work and all renovation, no interruption of services offered by the Hospitals is permitted. Consult and carefully schedule with the Owner to comply with this requirement. The Owner will cooperate within reason, but the need to provide full, uninterrupted medical care will supersede any construction aspect.
- B. Owner may direct Contractor to cease work where Contractor's operations interrupt hospital functions.
- C. Contractors Requests to Owner: All Contractor request to be given to Construction Manager in writing with advance notice not less than the following:
 - 1. Power Shut-down or Life Support: 15 working days; see ELECTRIC SHUT-DOWN/LIFE below.
 - 2. All others: 72 hours

1.03 PROCEDURE IN OPERATIONAL HOSPITAL

- A. The Hospital must remain in operation at all times. Where the Hospital vacates to allow work in an area, services and utilities may be cut as long as the continuity of the service does not affect other areas. Access must be maintained to all other areas in a safe and sanitary manner. Compliance with good safety practice is to be exercised at all times. Work shall be done in a manner so as to protect patients, visitors, employees and equipment. Safe equipment only shall be used, and used in a safe manner. Unsafe conditions such as obstacles in corridors, improperly made connections, unstable piling of materials, loose material overhead tripping and hazards shall be avoided.
- B. Conduct: Contractor and workmen under his control to be quiet and non-offensive.
 - 1. Radios are prohibited.
 - 2. Contractor's employees must stay in assigned area at job site and not visit other areas unless authorized to do so by an Owner's Representative. Eating areas will be designated for contractor's use.
 - 3. Soliciting, selling of any merchandise or distribution of any literature for any cause is strictly forbidden.
 - 4. Gambling, intoxicating liquor, or drugs in any form are forbidden at all times.
 - 5. Use of Owner's telephone is strictly forbidden.
 - 6. Contractor is to designate a hospital where personnel are to be treated in the event of an injury.
 - 7. Contractor parking to be in approved staging areas or off site. No parking in Hospital parking lots allowed with out permission of Construction Manager.
- C. Dress Code:
 - 1. Required Apparel: Shirt, long pants, shoes with laces: all suitably clean. **All workers**

on-site must be wearing a company shirt displaying their company name / logo at all times. Contractors must provide and pay for the shirts for their workers.

2. Not permitted: Offensive graphics or messages on clothing, short pants, tank tops, sandals, open toed shoes, bare torso, and bare feet.
 3. Safety glasses and hard hats are to be worn as needed. The Contractor shall also provide personal protective equipment when necessary.
- D. No utilities or services may interrupt without full consent of and prior scheduling with the Contractor. All functions of existing building must be maintained at all times unless specific written permission is obtained from the Owner. Critical functions include, but are not limited to:
1. Exits.
 2. Utilities.
 3. Service functions including access for refilling existing oxygen tank.
 4. Public access to building during normal business hours.
 5. Fire department access.
 6. Fire protection/detection systems.
- E. Noxious Fumes/Odors: Provide special filtering or direct exhaust to exterior for processes involving strong odors, fumes, or VOC's which may be either offensive or detrimental to patients.
1. Advise Owner in advance of work for determination of filter/exhaust requirements.
 2. Cautions:
 - a. Exterior work near fresh air intakes subject to special filtering requirements.
 - b. Interior exhaust must not be recycled into fresh air intakes without special filtering requirements.

1.04 EXISTING FACILITIES

- A. Existing elevators, telephone, vending machines, cafeteria, or other facilities are not permitted to be used by Contractor or his employees and Subcontractors without Owner permission.
- B. Existing toilets: Contractors and Subcontractors cannot use hospital bathrooms without Owner permission, See Section 01 5000 – Construction Facilities and Controls.
- C. Construction materials, toolboxes, etc., shall not enter elevators occupied by patients.
- D. Every effort shall be made to prevent dust, dirt, mud, etc. from being tracked down corridors and stairways, etc.
- E. Due caution shall be taken when pushing carts through corridors, to prevent injury to patients, visitors, or employees.

1.05 NOISE AND SAFETY

- A. Construction noise limited to Normal Working Hours. Construction Manager & Owner can have any contractor stop work that is disrupting the patients or staff of the hospital until this is resolved. No additional payments will be allowed due to contractor's compliance with above restrictions.
- B. In no instance may a corridor be blocked nor its clear width reduced either to less than 4'-0" or to less than the minimum exit required in accordance with the Uniform Building Code, whichever is greater.
- C. No live electrical wiring may be left exposed, including temporary lighting in areas of public or staff access.

1.06 NO SMOKING POLICY

- A. Smoking on Hospital property is prohibited.

1.07 WORKING HOURS

- A. Normal hours: Perform work between the following hours, Monday through Friday: 7:00am to 4:30pm
- B. Non-Normal hours: Should the Contractor be unable to schedule his work within normal working hours as it would negatively impact the ongoing operation of the hospital, they may request the Construction Manager in writing, to permit work to be performed during non-normal hours. Submit schedule of hours, days, and location of request work.

1.08 ELECTRICAL SHUT-DOWN/LIFE SUPPORT

- A. Advanced Notice Required: Contractor to request, minimum 15 working days in advance. Owner's permission to shut down any electric power, medical gasses or other life-support systems to occupied portions of the building. Request to be in writing and indicate area(s) affected, time and date shut-down requested to commence, and anticipated duration of shut-down. Approved time and date may be during non-normal working hours.
- B. No additional payments will be allowed due to contractor's compliance with above restrictions.

1.09 JOINT COMMISSION REQUIREMENTS

- A. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires the Owner to comply with the "Interim Life Safety Measures", Appendix "E" of 1996 Accreditation Manual for Hospitals listed below. Each Contractor is also required to comply with this requirement and cooperate with the Owner so as not to place the Owner in violation of these requirements.
- B. Interim Life Safety Measures (ILSM) are a series of 11 administrative actions required to be taken to temporarily compensate for the hazards posed by existing Life Safety Code (LSC) deficiencies or construction activities.
- C. Implementation of (ILSM) is required in or adjacent to all construction areas and applies to all personnel, including construction workers.
- D. Interim Life Safety Measures (ILSM):
 - 1. Ensure exits provide free and unobstructed egress. Personnel shall receive training if alternative exists must be designated.
 - 2. Ensure free and unobstructed access to emergency departments/services and for emergency forces.
 - 3. Ensure fire alarm, detection, and suppression systems are not impaired. A temporary, but equivalent, system shall be provided when any fire system is impaired. Temporary systems must be inspected and tested monthly.
 - 4. Ensure temporary construction partitions are smoke tight and built of noncombustible materials.
 - 5. Provide additional fire fighting equipment and use training for personnel.
 - 6. Prohibit smoking in and /or adjacent to all construction areas.
 - 7. Develop and enforce storage, housekeeping, and debris removal policies and procedures that reduce the flammable and combustible fire load to the lowest level necessary for daily operations.
 - 8. Conduct a minimum of two fire drills per shift per quarter.
 - 9. Increase hazard surveillance of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field offices.
 - 10. Training personnel when structural or compartmentation features of fire safety are compromised.
 - 11. Conduct organization-wide safety education programs to ensure awareness of any LSC deficiencies, construction hazards, and these ISLM.
- E. Questions concerning the implementation and use of ISLM should be directed through the Owner and to the Department of Plant and Technology Management at the Joint Commission.

1.10 JCAHO SAFETY CHECKLIST

- A. Each Contractor/Sub-Contractor to complete the Joint Commission Safety Checklist (attached to end of this Section) form weekly and return it to Construction Manager for their record. Contractor to stay in compliance with this Check List at all times; however, where the Construction Documents, codes, or other applicable ordinances conflict, the more stringent requirement shall apply.
- B. No additional payments will be allowed due to contractor's compliance with above restrictions

1.11 PROJECT CATEGORY MATRIX

- A. Each Contractor/Sub-Contractor to follow the recommended Infection Control Precautions (attached to end of this Section).
- B. Each item will be evaluated with the Owner's Infection Control personnel to determine effective and practical applications based on this project.
- C. No additional payments will be allowed due to contractor's compliance with above restrictions

1.12 CLEAN-UP AND MATERIAL MOVING

- 1. Keep working area as clean as possible at all times. Do not allow refuse and debris to accumulate. Pile materials neatly and safely, at a safe distance from hot piping, and off roadways and walkways. Do not leave tools or materials on steps, walkways, platforms, or elevated equipment or pipes. Remove lumber with protruding nails to safe area and remove or bend nails over. All refuse and debris must be removed from work area by contractor each day and disposed of in a legal dumping site, approved by Owner.
- 2. Each Trade Contractor and their subcontractors shall do their own clean-up and haul debris away, dumpster to be paid for by each contractor, move materials that are in the way of construction, and repair and replace damage they do.
- 3. If the above work is not accomplished in a reasonable length of time, the Construction Manager will do the required work. Cost of the work will be charged to the Trade Contractor. After all Trade Contractors have debris removed during construction in compliance with the above, remaining clean up shall be performed by each contractor.
- 4. Each Contractor shall do all cleaning of finish surfaces relative to their work prior to acceptance of their work. Each Contractor shall comply with all special cleaning instructions contained in the Section 01780.

END OF SECTION 01 3520
SEE ATTACHMENTS:
"A" JOINT COMMISSION SAFETY CHECKLIST
"B" PROJECT CATEGORY MATRIX
"C" RECOMMENDED INFECTION CONTROL PRECAUTIONS

**JOINT COMMISSION SAFETY CHECKLIST
ATTACHMENT A**

	<u>IN COMPLIANCE</u>	
	YES	*NO
1. Ensure required with the project limits. Provide free and unobstructed egress.	_____	_____
2. Contractor shall ensure his work does not obstruct access to emergency department/services and/or access for emergency forces.	_____	_____
3. Contractor shall ensure his work does not impair fire alarm detection and/or fire suppression systems without a temporary, but equivalent, system provided. Temporary systems shall be inspected on a regular basis by Contractor if the system is implemented because of worked involved in this project.	_____	_____
4. Contractor shall ensure temporary construction partitions are smoke tight and constructed of non-combustible material.	_____	_____
5. Contractor shall enforce the Hospital's (Owner's) smoking procedures with his employees and subcontractors. Smoking shall be prohibited in or adjacent to all construction areas.	_____	_____
6. Contractor shall develop and enforce policies and procedures for storage of materials and removal of debris that shall reduce the flammable and combustible fore load to the lowest level necessary for daily operations. The policy shall be submitted to the Hospital (owner) in written form for his review and approval.	_____	_____
7. Contractor shall participate in fire drills.	_____	_____
8. Contractor has notified Owner before structural or compartmentalization features of fire safety are compromised.	_____	_____

*If any of the above are answered "NO", indicated why; also state what corrective action will be taken to be in compliance and when it will be in compliance.

I, _____, representing _____
(Print Name)

hereby certifies that my response to the above statements are true and accurate to the best of my knowledge.

(Sign)

(Date)

**PROJECT CATEGORY MATRIX
ATTACHMENT B**

	Low Risk Areas Offices, Support areas, Lobbies,	Medium Risk Areas Non-invasive patient care, Cardiology, PT/OT, Radiology, Nuclear Medicine, Endoscopy, Food Service areas	High Risk Areas: Special Care Areas, ER, LDR, Nurseries, Peds, Pharmacy, Recovery rooms, Outpatient Surgery, Laboratory	Extreme Risk Areas Areas with Immuno-compromised Patients, Transplant Area, Cardiac Cath Lab, OR's ICU's Isolation Rooms, Sterile Supply areas, Burn Unit, Negative Pressure Isolation Room, Oncology, Medical Units (if occupied during construction)
Inspection and noninvasive activities: Inspections above ceiling, minor repair, painting or wall covering (no patching), Minor electrical or plumbing work or similar work with little or no drilling, cutting, or other dust-raising activity. Normal maintenance activity.	Category 1 precautions	Category 2 precautions	Category 2 precautions	Category 3 precautions
Small Scale Projects of short duration that create minimal dust: Installation of electrical and computer cabling, Opening into chases and concealed spaces, cutting plaster and drywall, sanding and other dust making/ activity within a room or other controlled area.	Category 1 precautions	Category 2 precautions	Category 3 precautions	Category 3 Precautions
Larger Scale Projects that produce a moderate to high amount of dust or requires demolition or removal of any fixed building components or assemblies: Removing floor coverings, sanding walls, wall demolition and construction, minor duct work or electrical work above ceilings, major cabling work.	Category 1 precautions	Category 2 precautions	Category 3 precautions	Category 4 precautions
Major Renovation and Construction: Major demolition of areas, particularly those open to patient care, work on HVAC Systems, new construction	Category 2 precautions	Category 3 precautions	Category 4 precautions	Category 5 precautions

**RECOMMENDED INFECTION CONTROL PRECAUTIONS BY CATEGORY
ATTACHMENT C**

CATEGORY 1:

	Protect patient care areas from activity, or enclose work area (close doors). Replace ceiling tiles promptly.
	Minimize dust and dirt, clean or have area cleaned when done, and when dust or dirt builds up. Vacuum with HEPA post-filter type vacuum, and/or damp mop areas when work complete.

CATEGORY 2:

	Protect patient care areas from activity by closing doors, or enclosing area with plastic or equivalent. Replace ceiling tiles prior to removal of enclosures.
	Use water spray mist to minimize dust when opening ceilings, and conducting activities that will cause dust or dirt to be airborne.
	HVAC System: - filter return air - Close off HVAC system openings (exhaust and supply) with plastic or equivalent. - utilize a "clean air machine." or powered HEPA filters in exhaust path, or exhaust directly to outside
	Use dust mats at entrances. Wet mops areas during and after construction to remove and control dust and dirt with suitable cleaning agents. Use HEPA filters on vacuums used in area for cleanup. Wipe down all horizontal surfaces (except floor and ceiling) with suitable disinfectant at conclusion of job.
	Control of Debris: use covered container to remove debris through internal hospital paths.

At Job Completion:

	Replace all ceiling tile, or re-close ceiling.
	Wipe down all horizontal surfaces (except floor and ceiling). Wet mop or extract floor with disinfectant approved by Infection Control. If appropriate, vacuum all areas with HEPA Post-filters on vacuum.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job.
	Maintain all enclosures practical until post-job cleaning complete. Use vacuum with post-HEPA filters during removal of barriers, as practical.

CATEGORY 3

	Isolate the HVAC systems in area where work is being performed to prevent contamination of the duct system. Maintain negative air pressure within the construction site if possible. Utilize HEPA-equipped air filtration units as necessary.
	Provide necessary construction separations. Enclose work areas prior to any demolition work or opening any walls or ceilings as practical.
	Debris must be removed in covered containers. The debris removal containers should be vacuumed or wet-wiped prior to removal from the site.

At Job Completion:

	Maintain barriers in place as much as practical until final cleaning is complete. Removal of barrier materials should be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers (to the extent practical based on the system).
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

CATEGORY 4

	Use all CATEGORY 3 precautions, plus:
	Isolate HVAC System and seal with at least plastic and tape. Where pressure may exist, use sheet metal or similar rigid materials in addition of plastic and tape, to minimize accidental movement of air in ductwork. Isolate the ductwork as close to the construction barrier as practical.
	Seal all holes, penetrations, and openings in the construction barriers and walls which are part of the construction separation with appropriate materials. Hole in fire rated separations must be equivalent in fire rating. Other holes must be sealed with tape and plastic, or similar materials which are strong enough to withstand the pressure differential without leakage.
	If practical, create a construction ante-room where all clothing, tools, equipment, and other materials being removed are vacuumed or wet-wiped prior to being taken off site through the hospital patient care areas. Cart wheels should also be cleaned. Any person who has dust, dirt, or materials on their clothing must vacuum it prior to leaving the ante-

	room areas. The ante-room will be wet mopped frequently (several times a day in usual construction activity), or similar methods will be used to satisfy the Infection Control staff.
	If practical, personnel working in the area must either change clothing prior to leaving the job site, or use shoe covers, and cover clothing prior to leaving the area.

At Job Completion

	Maintain barriers in place until final cleaning is complete. Removal of barrier materials must be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters. Air pressure should be maintained negative to patient care areas during final cleanup.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers. If necessary allow the HVAC to blow into the site with the clean air machine catching the output of the supply, and the machine feeding the air to the returns.
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

CATEGORY 5

	Use all CATEGORY 4 precautions, plus:
	As practical, use a "Clean-Air" machine, both to recirculate air in the job site to reduce airborne dust, and to exhaust air from the job site, to maintain a pressure negative to the air outside the job site, so leakage will be into the job site. The same machine may be used for both purposes, if it has suitable capacity.
	As practical, use a two chamber "air-lock" or similar method to assure no open path exists from the job site into patient care areas at any time. Wet-wipe down all materials and containers being removed from the site with appropriate disinfectant, in the air-lock, to assure no dust leaves the site. The clean lock must be mopped frequently and not allowed to become dirty. It should be as clean as a patient care area. Enclosed carts may be loaded from the dirty to the clean side of the airlock (if outside doors are closed, and other precautions followed to assure airborne dust cannot escape the worksite.
	As practical, all materials removed from the site during work activity must be either wet-wiped, or placed in containers which can be wet-wiped prior to removal. This includes debris removed through the hospital routing, and other materials removed from the site.

At Job Completion

	Maintain barriers in place as much as practical until final cleaning is complete, and site inspected by Infection Control. Removal of barrier materials should be accompanied by vacuuming using a vacuum with HEPA-filtered post-filters.
	Clean HVAC system as closure being removed, and operate system for 24 hrs prior to final cleaning of job and removal of barriers. If necessary allow the HVAC to blow into the site with the clean air machine catching the output of the supply, and the machine feeding the air to the returns. The Clean Air Machine HEPA should be replaced or examined to assure it is working appropriately, and pre-filter replaced prior to the final air system cleaning, so dust from the system can be visually evaluated.
	Site must be thoroughly cleaned, by damp-wiping all horizontal surfaces with disinfectants approved by Infection Control.

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.
- H. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.04 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.

- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary scaffolding.
 - 3. Temporary bracing.
 - 4. Temporary stairs or steps required for construction access only.
 - 5. Temporary hoist(s) and rigging.
 - 6. Investigation of soil conditions and design of temporary foundations to support construction equipment.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

1.07 QUALITY ASSURANCE

- A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 4. Laboratory: Authorized to operate in the State in which the Project is located.
 - 5. Laboratory Staff: Maintain a full time specialist on staff to review services.
 - 6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.

- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Attend preconstruction meetings and progress meetings.
 - 8. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

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

3.04 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 45 33
CODE-REQUIRED TESTING AND SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.
- D. Manufacturers' field services.
- E. Fabricators' field services.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 40 00 - Quality Requirements.
- D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 ABBREVIATIONS AND ACRONYMS

- A. AHJ: Authority having jurisdiction.
- B. NIST: National Institute of Standards and Technology.

1.04 DEFINITIONS

- A. Code or Building Code: ICC (IBC), International Building Code, Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements and specifically, Chapter 17 - Special Inspections and Tests.
 - 1. Boone has adopted ICC (IBC) 2015.
 - 2. State is currently under ICC (IBC) 2015.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. Special Inspection:
 - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
 - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.05 REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Testing & Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.

- C. Special Inspection and Test Reports: After each special inspection or test, promptly submit two copies of report; one to Architect and one to the AHJ.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of special inspection.
 - h. Date of special inspection.
 - i. Results of special inspection.
 - j. Compliance with Contract Documents.

1.07 TESTING AND INSPECTION AGENCIES

- A. Owner will employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
 - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
 - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. See Division 03 sections and Structural Drawing General Notes

3.03 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 - 1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified reference standards.
 - 4. Ascertain compliance of materials and products with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the work.

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

3.04 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 - 1. Test samples submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.05 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Contractor Responsibilities, General:
 - 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
 - 2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 - 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

3.06 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

- A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.

- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION

SECTION 01 5000 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and FAX service, water and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Facilities: Parking, progress cleaning, project signage, and temporary building.

1.02 GENERAL

- A. Install temporary facilities and utilities in conformance with State and Local Codes and requirements.
- B. Obtain and pay for required applications, permits and inspections.
- C. Early Service: Any Contractor requiring temporary service before it can be provided as specified, or whose requirements with respect to a particular service differ from the service specified shall provide such service as suits his needs, at his own expense, and in a manner satisfactory to the Construction Manager.
- D. Maintenance: Temporary facilities and utilities are to be maintained and kept in good operating condition. Maintenance men necessary to perform this work shall be provided in accordance with requirements. Maintenance time will include normal working hours for all trades and start up and shut down overtime as required.
- E. Removals: Subject to approval of Construction Manager, contractor providing temporary facilities or services shall remove same when no longer required or when their function is replaced by authorized use of permanent facilities. Other removal time may be directed by Construction Manager.
- F. Disclaimer: Specific administrative and procedural minimum actions are specified in this section, as extension of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect, Engineer or Construction Manager that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

1.03 TEMPORARY SANITARY FACILITIES

- A. The Construction Manager will provide temporary restroom facilities. The use of hospital facilities is prohibited.

1.04 TEMPORARY HEAT

- A. General Responsibilities: Temporary heating responsibilities and equipment types relate to the extent of building enclosure and work performed as follows:

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1. Prior to Enclosure of any Type: Temporary heat for the building prior to the building being partially enclosed is each Trade contractor's responsibility. Each Trade Contractor shall provide, at his own expense, all cold weather protection and temporary heat as required to carry out his work expeditiously during inclement weather and to protect all his work and materials from damage by the weather.
 - a. Equipment: No restrictions are placed on heating equipment except that such equipment shall conform to applicable safety regulations and its use shall not damage or otherwise be detrimental to the appearance of the Work.
 - b. Cost: All Costs borne by Trade Contractor providing temporary heat.
 - c. Work Restrictions: No work with interior type finishes or work permitted which may be damaged by direct contact with water.

B. Mechanical Trade Contractor Responsibilities:

1. Maintain as to temperatures and ventilation required for work in various parts of the building as follows:
 - a. Stored Materials: As recommended by manufacturer.
 - b. Installed Materials: As recommended by manufacturer for the length of time following installation.
2. Maintain that portion of any floor thereof which has been constructed, or partly constructed, at a temperature and humidity that will ensure against damage due to warping, buckling, excessive shrinkage, etc., and adequate ventilation until the permanent HVAC system is operating. Trade Contractor will be responsible for damage to work under other contracts due to smoke or other damage caused by improper temporary heating.
3. Installation, connection, operation, and maintenance of temporary heating and ventilating devices to be performed by tradesmen proficient in the skills required and meet requirements of applicable regulator agencies.
4. Temperature Requirements:
 - a. Provide temperatures required in various parts of the buildings as specified herein below:
 - b. All Trades: provide the range of temperatures required for temporary heat, so the temperature as recommended by the manufacturer of the material concerned is maintained while such materials as mentioned above are stored in the building or being installed, and for the length of time recommended following installation. In those portions of the building where work is in progress or completed, it must be protected from freezing if subject to damage there from.
5. During General Contract Work: Provide the following:
 - a. During installation of gypsum wallboard or gypsum lath, a temperature of not less than 55 deg F during working hours, and a temperature of at least 40 deg F at all other times throughout the heating season.
 - b. Wall before plaster work or joint work for gypsum wall board begins and continuous throughout setting and drying periods, a temperature range between 50 and 75 deg F shall be maintained day and night. During this period, no finish woodwork, resilient flooring or flexible wall coverings shall be installed or stored in the buildings, and no finish painting or applying of finish wall coatings shall be undertaken.
 - c. For a period of 10 days previous to the placing of interior wood finish and throughout the placing of this and other interior finishing, varnishing, painting, etc., and until final acceptance of the work or until fully occupied by the Owner, provide sufficient heat to produce a temperature range between 60 deg F and 75 deg F.
 - d. During and after installation of millwork, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
6. Permanent Systems:
 - a. The permanent HVAC system can be used for temporary heating, cooling and ventilation so long as the following maintenance includes the following:

- i. Proper operation and maintenance of the HVAC plant until acceptance of building by Owner.
 - ii. Maintenance of temporary filters in all equipment to prevent accumulation of dust and dirt in coils, housing, and ductwork.
 - iii. Prior to Final Inspection: Replacement of all (temporary and existing) filters with new filters, thorough cleaning of coils and other equipment, putting entire system into first class condition, cleaning traps and devices, adjustment and renewal of all materials and equipment not functioning correctly.
 - iv. Use of permanent heating or cooling equipment for temporary heating or cooling shall not affect guarantee. Guarantee shall take effect at time of building acceptance by Owner. Mechanical contractor to provide extended warranty as needed.
 - v. Cost of all fuel for operation of permanent heating system shall be paid by the Construction Manager and be reimbursed in full by the Owner.
 - b. Close off return air to the permanent systems and provide only single-pass air during the course of construction. This practice shall remain in place until area is clean and system is ready for final balancing.
 - c. Replace filters in all equipment to prevent accumulation of dust and dirt in coils, housings, and ductwork.
- 7. Prior to Final Inspection:
 - a. Replace temporary filters with new filters.
 - b. Thoroughly clean coils and other equipment.
 - c. Clean traps and devices, adjust and renew any and all materials and equipment not functioning correctly.
 - d. Vacuum clean the duct system.
 - e. Restore equipment to like new condition.

1.05 TEMPORARY LIGHT AND POWER

- A. Each Trade Contractor: Provide temporary light and power for his own construction field office.
- B. Electrical Trade Contractor:
 - 1. Provide temporary light and power distribution for construction purposes for all trades including the cost of running temporary service from the utility supply. The temporary lighting and power system shall comply with all applicable OSHA regulations.
 - a. Temporary power to be sufficient to operate all "light tools" and equipment (electric arc welders excluded) and permanent building equipment including the HVAC system.
 - b. Additional temporary power required by other trades to be furnished, at their cost, up to the power available.
- C. Electrical work shall conform to requirements of the National Electrical Code and all federal, state and local requirements. The Electrical Contractor shall obtain and pay for applications, permits and inspection pertaining to this work.
- D. Each trade shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided above.
- E. The electrical requirements for all temporary heating and ventilating systems shall be connected directly to the project temporary power system until the primary service is installed.
- F. Temporary work shall be installed in such a manner as not to interfere with the permanent construction.

1.06 TEMPORARY LIGHTING

- A. The Electrical trade contractor to provide and be responsible for the following: Temporary lighting distribution to be made from the temporary panels indicated above. Each circuit shall consist of "pigtail" receptacles on 20 foot centers with 200 watt lamps installed in every other receptacle leaving the alternate receptacles for added concentration of lighting as needed. Wire fixtures with #8 AWG wire and suspend at least 10'-6" above the floor.

1. As interior partitions are erected, revise the temporary lighting arrangements so that not less than 1 lamp is provided in each space if needed for work or required for safety. Also, install lights as directed by Construction Manager, in smaller areas where required to provide adequate light for work being carried out in the space.
2. Receptacle Outlets: See temporary light and power.
3. Furnish and install 200 Watt lamps for general circuit lighting and all fuses as may be required for a complete job.
4. Replace lamps, fuses, including theft, throughout the life of the project.
5. Install and maintain a reasonably balanced system and take current readings on the feeders at regular intervals as required. Correct any serious phase unbalance.
6. Protect the installation against weather damage, normal operations of other trades, and other persons on the site. Be responsible for the proper use and maintenance of temporary wiring systems until they are removed.

B. Each trade shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided above.

1.07 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction area, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.

B. Provide protection for plant life designated to remain. Replace damaged plant life.

C. Protect no-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Provide temporary drainage trenches, drains, sumps, pumps, or other items required to afford satisfactory working conditions for the execution, completion and protection of the work. Water shall be diverted to or shall be pumped into existing sewerage systems or ditches and shall not be allowed to run onto ground surface area.

1.09 EXTERIOR ENCLOSURES

A. Temporary enclosures shall be provided insulated and weather-tight at exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

1.10 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas and other trades, to prevent penetration of dust and moisture into Owner occupied areas or other trades areas, to prevent damage to other areas and equipment weather existing or work by other trades.

- B. Provide all shoring and bracing required for safety and proper execution of the work. Remove the items when the work is completed.
- C. Paint surfaces exposed to view in Owner occupied areas.

1.11 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection to protect work by other contractors.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects by protecting with durable sheet materials.
- E. Prohibit traffic or storage on waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendation for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.12 ROOF PROTECTION

- A. After completion of work operations on roof, remove any temporary protection, restore roof to pre-construction condition, and repair damage to roof, if any; see below.
- B. All costs associated with repairs and water tight conditions during course of construction, if any, to be borne by the Prime Contractor who caused the damage.

1.13 WEATHER PROTECTION

- A. Protect work and existing or adjacent property against weather, to maintain their work, materials, apparatus and fixtures free from injury or damage in accordance with the General conditions during the entire construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Work damaged by failure to provide weather protection all be removed and replaced with new work at the contractor's expense.
 - 1. Provide temporary non-staining waterproof covering for tops of all exterior walls keep cavities and wall materials dry. Coverings to shed water to exterior and lap wall assemblies not less than 4 inches. Maintain in watertight condition until permanent coverings are in place. Coordinate with similar requirement specified under Division 06.
- B. Remove all snow and ice as may be required for proper protection and execution of the work and protect and safety of the public.

1.14 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, and theft.
- B. Coordinate with Owner's security program.
- C. Require all workers on Project to govern themselves under same rules and regulations as employees of Community Memorial Hospital, who will concurrently occupy premises.

- D. A property pass, properly approved by the CEO, COO, or Facilities Manager must be secured to remove any non-personal articles. Packages, lunch boxes, clothing may be inspected by Security as employee leaves.

1.15 ACCESS TO SITE

- A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Fire lanes and aisles to fire fighting equipment shall be left unobstructed at all times.
- E. Material is never to be piled in front of fire equipment, fire doors, or hydrants.

1.16 PARKING

- A. Parking for Contractor's firm owned vehicles is limited, in number and location, to staging areas designated by the Construction Manager. No parking or obstructing egress to and from Parking Areas will be allowed unless authorized by Owner.
- B. **Parking of private vehicles of workers shall be off-site. The parking on-site is limited so contractor's need to find parking off-site. Contractors should find appropriate locations to park.**
- C. Traffic and parking regulations of Owner are applicable and violators are subject to fines for infractions.
- D. When site space is not adequate, provide additional off-site parking.

1.17 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Remove waste materials, debris, and rubbish from building daily.
- E. Carts, trucks, etc. used to transport materials shall be loaded in a safe manner. Materials shall not protrude beyond the sides of conveyance used.
- F. Materials shall not be thrown or dropped from scaffolds or other overhead areas.
- J. Gasoline or other highly flammable liquids shall not be brought inside facilities.
- K. Spills of any materials creating hazards shall be cleaned up immediately.

1.18 HAUL ROUTES

- A. Haul routes shall be designated by Owner and Construction Manager.
- B. Confine construction traffic to designated route.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.
- D. Contractor is responsible for keeping all public streets and owner occupied paving clean.

PART 2 PRODUCTS

2.01 TEMPORARY FIELD OFFICES

- A. General:
 - 1. Construction: Offices to be weather-tight, heated, air-conditioned, lighted, doors with locks, and furnished with private line telephone.
 - 2. Expenses:
 - a. Construction Manager: All expenses in connection with his or Architect's Field Offices, including the installation costs and use of telephones, heat, air-conditioning, light, water and janitor service shall be paid for by the Construction Manager and will be fully reimbursed by the Owner.
 - b. Prime Contractors: All expenses associated with their offices including utility installation costs shall be included in their bid.
 - c. Toll Costs: All long distance calls to be paid for by party placing call including Architect, Owner's representative, and contractors.
 - 3. Field Offices shall be maintained until final acceptance and then be removed by the responsible party, no later than fifteen (15) days after acceptance of building, unless the Construction Manager orders or approves earlier removal.
- B. Construction Manager shall provide temporary field office for his use and for job meetings. This office will have phone and fax for use by other Prime Contractors.
- C. Each Prime Trade Contractor: To keep a complete set of drawings, and specifications kept marked up to date with revision, Addenda, as-built drawings, and all permits and approved shop drawings on file. Each Prime Contractor is also responsible to ensure their field personnel have the same information on the jobsite.

PART 3 EXECUTION

3.01 USE OF PERMANENT SYSTEMS AND FACILITIES

- A. Obtain written agreement with Owner, establishing start of warranties and conditions of use:
 - 1. Systems complete, with utility connections and safety devices.
 - 2. Automatic controls operational.
 - 3. Temporary filters and items required for protection of equipment and finishes are in place.
 - 4. Replace items damaged during temporary service use.

3.02 TOOL AND EQUIPMENT USE ON HOSPITAL PROPERTY

- A. Use of power-actuated tools is limited and shall not be used unless authorized by the Owner's Representative.

- B. All tools and equipment must conform to OSHA Safety Code and State Codes. All contractors' equipment must be removed upon completion of the job.
- C. Before any hot work is started in an area of the facilities, a fire permit must be obtained from the Owner:
 - 1. All welding.
 - 2. Torch cutting.
 - 3. Soldering.
 - 4. Melting of metals.
 - 5. Any operation where open flames or sparks are present.
- D. Necessary precaution and protection is to be exercised to prevent fires and damage from falling sparks from welding and cutting operations. This must be done before the Owner's Safety Department okay will be given for any hot work.

3.03 CLEAN-UP AND MATERIAL MOVING

- A. Keep working area as clean as possible at all times. Do not allow refuse and debris to accumulate. All refuse and debris must be removed from work area by contractor each day and disposed of in a legal dumping site.
- B. Each Trade Contractor and their subcontractors shall do their own clean-up, move materials that are in the way of construction, and repair and replace damage they do.
- C. If the above work is not accomplished in a reasonable length of time, the Construction Manager will do the required work. Cost of the work will be charged to the Trade Contractor.
- D. Each Contractor shall do all cleaning of finish surfaces relative to their work prior to acceptance of their work. Each Contractor shall comply with all special cleaning instructions contained in the Specification.

END OF SECTION 01 5000

SECTION 01 5200 – PAY APPLICATION AND SCHEDULE OF VALUES

- A. All pay requests shall be submitted on form AIA G702/CMA *Application and Certification for Payment*.
- B. All Applications for Payment shall have a schedule of values submitted on form AIA G703. Include breakdown of costs for all components, systems, and types of work. Provide a labor, material and equipment breakdown for each item.
- C. Submit a proposed Schedule of Values to the Construction Manger for review and approval within 15 business day from receipt of a notice of award. The Schedule of Values shall separate the cost of the work into identifiable sections for use in determining the percentage complete for each pay application. Separate lines on the Schedule of Values shall be provided for all divisions of work; labor, material, equipment, and major components.
- D. In the Schedule of Values, have one item labeled closeout. This line item will be worth 3% of the bid package. This line item is not part of the 5% retainage. This will be used to track progress of turning in warranties, O&M's, extra materials, and other closeout documentation. Owner training and as-built drawings will be exempt from this line item. No partial payment is made on this line item until all items have been approved.
- E. The Schedule of Values shall be broken down into the following areas as per Section 01 5201.
- F. Pay Applications shall be submitted to the Construction Manger by the 20th day of the month and shall only include work complete for the same month. False or inaccurate pay applications will be rejected.
- G. Billing for stored materials is allowed, see the attached instructions.

INSTRUCTIONS FOR BILLING FOR STORED MATERIALS

If materials are stored at the construction site, they are not considered stored materials. The Owner and/or Construction Manager are not responsible to provide storage locations for project materials, tools, or equipment.

If materials are stored at a location other than the construction site, they are considered stored materials, and in order to invoice for such materials the following documentation is required:

1. A completed bill of sale signed by a company representative. A sample is attached.
2. A certificate of insurance equal to or in excess of the value of the stored materials being invoiced that clearly identifies insurance coverage includes the storage location where materials are being stored; the Owner shall be listed as an additional insured. Any and all insurance premiums and deductibles will be paid by contractor.
3. Digital photos of the stored materials, with the materials clearly marked "sold to ' Boone County Hospital '".
4. Notify the Construction Manager by the 18th day of the month to allow the Construction Manager and/or Owner to inspect and take photos of the stored materials prior to the review process, if they so desire.
5. Copies of material invoices from the contractor's supplier. The contractor can bill for the invoiced cost of the stored materials. All overhead and profit shall be billed for after material is delivered to the jobsite.

Bill of Sale for Offsite Stored Materials

Boone County Hospital
Boone, Iowa

Contractor / Vendor Name & Address: _____

Name and Address of Storage Location: _____

Contractor/Vendor for and in consideration of the partial payment to be made by "*insert the name of the Owner*" under the existing contract agreement hereby sells to "*insert the name of the Owner*" the personal property described in the attached invoice and as itemized: (attach additional sheets if required)

Item Description	Quantity	Value
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Contractor / Vendor shall clearly label all stored materials sold to the Owner, and shall be clearly marked in the provided digital photos. All stored materials shall be stockpiled separate from other materials, and shall not co-mingle with stock or stored materials for other projects.

The Owner and Construction Manager shall have free access to the storage location for inspection of all stored materials. The Owner may take possession of, obtain, remove, sell, or discard of any and all stored materials at any time, at their sole discretion.

Executed on this _____ day of _____ 20__.

Contractor / Vendor Signature

By: _____

Title: _____

Address: _____

END OF SECTION 01 5200

SECTION 01 5201 – ATTACHMENT PAY APPLICATION

ATTACHMENT AS CALLED OUT IN THE SUPPLEMENTARY CONDITIONS

All Pay Applications will be required to have schedule of values and also have the following costs broken out on the schedule of values *when applicable*; this will include all change orders. Review additional line item requests with the Construction Manager for approval.

SHELL BUILDING ELEMENTS

FOUNDATIONS AND SLAB ON GRADE

- SLAB CUSHION
- UNDER SLAB DRAINAGE
- FOUNDATION DRAINAGE
- SPREAD & EXT. COLUMN FOOTINGS
- FROST WALLS W/ INTEGRAL PIERS
- VERTICAL FOUNDATION INSULATION
- EXTERIOR COLUMN FOOTINGS (below frost)
- INTERIOR COLUMN FOOTINGS
- SLABS ON GRADE
- UNDER SLAB INSULATION
- STOOP SLABS W/FROST WALLS

BUILDING STRUCTURE

- SLAB ON DECK
- STEEL ROOF FRAMING (INCLUDES COLUMNS)
- MISC METALS
- BUILDING EXPANSION JOINTS

EXTERIOR WALLS

- METAL STUD BACK-UP WALLS
- PARAPET WALLS
- AIR-MOISTURE BARRIER
- RIGID INSULATION
- CAST STONE
- ALUMINUM STOREFRONT
- ALUMINUM CURTAINWALL
- EXTERIOR ALUMINUM ENTRANCES
- AUTOMATIC ENTRANCES
- LOUVERS
- EXTERIOR HM DOORS
- OVERHEAD COILING DOORS
- EXTERIOR WALL BLOCKING
- EXTERIOR CAULKING

EXTERIOR PAINTING
CANOPIES

ROOFING & SHEET METAL

ROOF CARPENTRY
TPO ROOFING/INSULATION
FLASHING & CAPS
ROOF WALKWAYS

INTERIOR FINISHES

TEMPORARY PARTITIONS
INTERIOR BLOCKING
PANELING & WOOD TRIM
MILLWORK (CABINETS & COUNTERTOPS)
NURSE STATION CASEWORK
LABORATORY CASEWORK
DOORS/FRAMES/HARDWARE
TWO HOUR RATED DOORS
INTERIOR GLASS
MIRRORS
NON-RATED INTERIOR GYP WALLS/INSULATION
TWO HOUR RATED WALLS
GYP BULKHEADS & CEILINGS
ACOUSTICAL CEILINGS
TILE WORK (FLOORS/WALLS)
FLOOR PREP
SHEET FLOORING
CARPET
PAINTING
VINYL WALL COVERING
CUSTOM GRAPHIC WALL COVERING
CUBICLE CURTAINS/TRACK
CHALK/TACK/MARKER BOARDS
WALL & DOOR PROTECTION
TOILET PARTITIONS
TOILET & BATH ACCESSORIES
FIRE EXTINGUISHERS
INTERIOR SIGNAGE
EQUIPMENT
WINDOW TREATMENT

MECHANICAL WORK

PLUMBING

SANITARY WASTE & VENT
STORM PIPING
DOMESTIC WATER PIPING
PLUMBING FIXTURE & DRAINS
PLUMBING EQUIPMENT

MEDICAL GAS

PIPING
EQUIPMENT
ELECTRICAL WIRING
CERTIFICATION

PIPING SYSTEMS FOR HVAC

HOTWATER HEATING BUILDING
HOTWATER HEATING PLANT
NATURAL GAS/PROPANE
STEAM PIPING STERILIZERS/HUMIDIFIERS
BOILERS/PUMPS/HYDRONIC SPECIALTIES
HEATING COILS

HVAC-SHEET METAL

DUCTWORK SYSTEMS

SUPPLY-MEDIUM PRESSURE
SUPPLY-LOW PRESSURE
RETURN
EXHAUST
VAVS
FANS
FCU
GRILLES, REGISTERS, DIFFUSERS
FIRE/SMOKE DAMPERS
BASIC COMMISSIONING
WARRANTY
START-UPS

OTHER MECHANICAL COSTS

TEST & BALANCE
DUCT INSULATION
PIPING INSULATION
FIRE CAULKING
TEMPERATURE CONTROL

FIRE SUPPRESSION SYSTEMS

WET SPRINKLER SYSTEMS
DRY SPRINKLER SYSTEMS
PREACTION SYSTEMS

ELECTRICAL WORK

SITE ELECTRIC

SECONDARY
LED LIGHT POLES/BASES
LIGHT BOLLARDS
MONUMENT SIGN WIRING

BUILDING ELECTRICAL

MAIN SERVICE
LIGHTING FIXTURES
SPECIAL LIGHTING CONTROLS
SWITCHES/OUTLETS/DISTRIBUTION
POWER WIRING
FIRE ALARM
CABLE TRAYS
NURSE CALL ROUGH-IN
NURSE CALL SYSTEM
VOICE & DATA ROUGH-IN
AV ROUGH-INS
TEMPORARY POWER

LOW VOLTAGE

VOICE & DATA CABLING
PAGING SYSTEM
SECURITY SYSTEMS
SECURITY CAMERAS

End of Section 01 5201

SECTION 01 5300 – CONTRACTORS COST SUMMARY WORKSHEET

1. The following is a copy of the Contractor's Cost Summary Worksheet. Each Contractor shall complete this form and submit it with proper supporting documentation for all cost changes.
2. The allowance for overhead and profit combined, included in the total cost shall be based on the amounts stated below:
 1. For the Contractor; for added work performed by the Contractor's own forces, 15 percent of the cost up to \$10,000 total change order cost including mark-up, 10 percent from \$10,000 to \$50,000, 5 percent above \$50,000; for deleted work performed by the Contractor's own forces, 5 percent of the cost.
 2. For the Contractor, for added or deleted work performed by the contractor's Subcontractor, 5 percent of the amount due the Subcontractor.
 3. For each Subcontractor or Sub-subcontractor involved; for added work performed by that subcontractor's own forces, 15 percent of the cost up to \$10,000 total change order cost including mark-up, 10 percent from \$10,000 to \$50,000, 5 percent above \$50,000; for deleted work performed by that Subcontractor's own forces, 5 percent of the cost.
 4. For each Subcontractor, for added or deleted work performed by the Subcontractor's Sub-subcontractors, 5 percent of the amount due the Subcontractor.
 5. In order to facilitate the checking of quotations for extras or credit, 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 Subcontract, they shall be itemized also. In no case will a change involving over \$250.00 be approved without such itemization.

Reference Cost Summary Sheet Example in Section 01 5300.01

END OF SECTION 01 5300



Building what's important.™

Contractor's Cost Summary

Project: _____

Reference: _____

Contractor: _____

Date: _____

This form, itemized accountings and appropriate supporting data must be attached to any Claim or Change Proposal.

(Only fill in applicable line items)

- 1. Labor *(including benefits) \$ _____
- 2. Materials * \$ _____
- 3. (Subtotal of lines 1 & 2) \$ _____
- 4. Overhead & Profit (% of line 3) \$ _____
- 5. Premium Time on Contract Work \$ _____
- 6. Major Construction Equipment * \$ _____
- 7. Subcontractor's name & cost: (Attached summaries & breakdowns)
 - a. _____ \$ _____
 - b. _____ \$ _____
 - c. _____ \$ _____
 - d. _____ \$ _____
 - e. _____ \$ _____
 - f. _____ \$ _____
 - g. _____ \$ _____
 - h. _____ \$ _____
- 8. Total Sub. Cost (total of lines 7a thru 7h) \$ _____
- 9. Contractor's O & P Sub's. Work (% of line 8) \$ _____
- 10. (Subtotal of lines 3, 4, 5, 6, 8 and 9) \$ _____
- 11. Bond _____% & Insurance _____% (if required) = _____% of line 10 \$ _____
- 12. Total Cost (total of line 10 and 11) \$ _____
 (If this is Sub's Summary, Contractor to include the amount of line 12 on line 7 of their Cost Summary)
- 13. Adjustment in Contract Time (calendar days): _____(Add) (Deduct).
 (Providing supportive data substantiating claim for additional days.)

***Attach breakdown of itemized accounting and supporting data.**

SECTION 01 5800 – CONSTRUCTION MANAGER SAFETY POLICY

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Near Miss/Accident Form	10

In the event of an emergency, dial 911 for ambulance service.

Minor first aid treatment is available in the Graham Construction jobsite trailer.

Weekly safety meetings will be completed throughout the duration of the project.

Accident report forms and “Near Miss” forms will be completed by the superintendent for incidents involving Graham Construction employees only. Subcontractors will be required to provide the same for their employees.

For safety concerns and questions contact:

Project Superintendent: Jed Bockenstedt

Project Manager: Vince Horras

Construction Management Safety Policy

In order to successfully complete the project, all contractors need to take necessary precautions during the course of their work to prevent injury to workers or the public. Contractors will abide by all regulations set forth by OSHA, local, state, and federal courts and agencies pertaining to the construction industry. Employee health and safety is a top priority on all Graham Construction Company job sites.

The intent of this document is to provide minimum guidelines for each contractors Safety and Health Program. The purpose is not to confine the requirements of the project to these guidelines but establish a safe work environment from the very beginning of the project. It is the contractual responsibility of each contractor to perform work in a safe manner in accordance with 29 CFR 1926 (code of federal regulations for the construction industry) as well as any other Federal, State, County, City or Owner required regulations pertaining to job safety and health.

Safety Responsibility

CONTRACTORS WILL:

- 1.) Each Contractor shall retain primary responsibility for its work and employees.
- 2.) Contractors will provide the following documents to the Construction Manager:

Toolbox Safety Meeting Reports	Weekly
Accident/Near Miss Reports	Within 24hrs of occurrence
Hazard Communication Program	Before start of work
MSDS	Before start of work
Jobsite Specific Safety Plan	Before start of work
Jobsite Specific Fall Protection Plan	Before start of work
- 3.) Designate one or more persons to act as safety representative. Duties include:
 - Be present on site when contractor is performing work
 - Perform Safety Reviews of work
 - Have authority to stop work if unsafe
 - Attend any safety meetings held by Construction Manager
- 4.) Communicate the contents of this program to workers.

CONSTRUCTION MANAGER WILL:

- 1.) Perform periodic safety surveys on site.
- 2.) Site surveys are done for the benefit of the owner and will not assume the responsibility of each contractor for the safety on site.

Employee Safety/Training

- 1.) Contractors will ensure that new employees are trained on their site specific safety plan as well as proper use of PPE.
- 2.) Weekly toolbox talks will be conducted by each contractor.

Drugs and Alcohol

Use or possession of alcoholic beverages or non-prescription drugs on the jobsite is forbidden. Workers reporting under the influence of alcohol or controlled substances will not be allowed to work.

Hazard Communication/MSDS

Employees will receive training on their rights, duties and responsibilities under the Hazard Communication Standard. Contractors will provide a physical copy of their Hazard Communication Program and site specific MSDS to be stored in the Construction Manager's on-site office. A copy of each contractors program and standard will be made available to all employees on request. Employees will review Material Safety Data Sheets when working with a covered material for the first time and anytime thereafter when a question arises. Safety precautions outlined on Material Safety Data Sheets are to be followed.

Housekeeping

Housekeeping is important to safety, quality and productivity. Each Contractor is responsible to keep their work area clean and remove scrap and debris generated by their work at regular intervals. Containers will be provided for collection and separation of all refuse. Covers are required on containers used for flammable or harmful substances.

At the end of each phase of work, return all tools and excess material to proper storage. Clean up all debris before moving on to the next phase. Employees are responsible for keeping their work area clean.

Helipad & Roof Replacement
Boone County Hospital
INVISION #24003

If contractors do not comply and the construction manager assigns clean up to another contractor, the non-compliant contractor will be liable for the cost.

Fire Protection

Fire fighting equipment must be conspicuously located and readily accessible at all times, and periodically inspected and maintained in operating condition. Any inoperable or damaged equipment must be replaced immediately when discovered.

1. Construction Manager will provide fire extinguishers in common areas.
2. Each contractor is required to provide additional fire extinguishers for their respective scope of work.
3. Fuel shall be stored in only approved OSHA containers that are properly labeled with its contents.
4. If hot work such as welding or cutting is performed, a fire extinguisher should be readily available and any combustible items shall be removed from the area. All prime contractors are responsible for their own fire watch. All hot work to be coordinated with on site CM prior to start of work.
5. Smoking is Prohibited on site and on Hospital grounds.

Motor Vehicles

Personal vehicles may only be parked in designated areas. The owner assumes no responsibility for any damage to any vehicle in or around the construction site.

Personal Protective Equipment

Each worker is responsible for wearing appropriate personal protective equipment in operations where there is exposure to hazardous conditions, or where need is indicated to reduce hazards.

1. Hardhats will be worn by all workers and visitors entering the site. Hardhats will be of the approved type and free from excessive damage or disrepair.
2. Eye Protection shall be worn at all times.
3. Gloves must be worn when work activity presents a potential hand injury or as deemed necessary by the situation.
4. Respiratory protective devices will be approved for the hazardous material involved, extent, and nature of work requirements and conditions. Employees required to use respiratory protective devices will be thoroughly trained in their use. Respiratory protective equipment will be inspected regularly and maintained in good condition
5. Proper Clothing must be worn at all times.
 - Shirts should cover the trunk of the body from neckline to belt line as well as from the neck to the shoulder. Short sleeve or sleeveless shirts are acceptable as long as there is no wording or illustrations that could be considered offensive to the general public.
 - Pants should cover the leg from the belt line to the boot top. Shorts will not be allowed.
 - Safety shoes are recommended, no canvas or leather type athletic shoes or shoes that do not have toes or heels will be permitted.
6. Hearing protection will be worn in areas where sound levels may exceed 85 decibels.
7. When signs, signals and barricades do not provide necessary protection on or adjacent to a highway or street, flag personnel or other appropriate traffic controls must be used. Flag personnel will wear a red or orange warning garment. Warning garments worn at night will be of reflective material
8. Safety Harness and Lanyards must be worn when required and inspected on a daily basis.

Compressed Air/Gas Cylinders

Compressed air used for cleaning purposes may not exceed 30 psi, and then only in conjunction with effective chip guarding and personal protective equipment. Exceptions to 30 psi are allowed only for

concrete form, mill scale and similar cleaning operations. The use of compressed air to clean off you or other workers is not allowed.

Put valve protection caps in place before compressed gas cylinders are transported, moved or stored. Cylinder valves will be closed when work is finished and when cylinders are empty or being moved. Compressed gas cylinders will be secured in an upright position at all times. Keep cylinders at a safe distance, or shield from welding or cutting operations and place where they cannot become part of an electrical circuit. Oxygen and acetylene must be stored at a minimum distance of 20ft apart or separated by a non-combustible barrier at least five feet high having a fire resistance rating of at least one half hour per OSHA standard 1926.

Oxygen and fuel gas regulators must be in proper working order while in use.

Ladders

The use of ladders with broken or missing rungs or steps, broken or split side rails, or with other faulty or defective construction is prohibited. When ladders with such defects are discovered, withdraw them from service immediately. Place portable ladders on a substantial base a 4-1 pitch, have clear access at top and bottom, extend a minimum of 36 inches above landing or, where not practicable, provide grab rails. Secure against movement while in use.

Portable metal ladders may not be used for electrical work or where they may contact electrical conductors. Job-made ladders will be constructed for their intended use. Cleats will be inset into side rails 1/2 inch or filler blocks used. Cleats will be uniformly spaced, 12 inches, top-to-top.

Scaffolds (General)

Scaffolds will be capable of supporting 4 times maximum intended load and will be erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement.

Guardrails and toe boards will be installed on all open sides and ends of platforms more than 10 feet above ground or floor. Exceptions to this would be needle beam scaffolds and floats, which require the use of safety belts. Scaffolds 4 feet to 10 feet in height, with a minimum dimension in either direction of less than 43 inches, will have standard guardrails installed on all sides and ends.

There will be a screen with maximum 1/2 inch openings between toe boards and guardrail, where persons are required to work or pass under scaffolds. Planking will be Scaffold Grade, or equivalent, as recognized by approved grading rules for the species of wood used. Overlap scaffold planking a minimum of 12 inches or secure from movement.

Scaffold planks will extend over end supports not less than 6 inches not more than 12 inches. Scaffolding and accessories with defective parts will be immediately replaced or repaired.

Scaffolds (Mobile)

Platforms will be tightly planked with full width of scaffold, except for necessary entrance openings. Platforms will be secured in place.

Guardrails made of lumber, not less than 2 x 4 inches (or equivalent) approximately 42 inches high, with a midrail of 1 x 6 inch lumber (or equivalent), and toe boards, will be installed at all open sides and ends on scaffolds more than 10 feet above ground or floor. Toe boards will be a minimum of 4 inches in height. Where persons are required to work or pass under scaffolds, install wire mesh between toe board and guardrail.

Scaffolds (Swinging)

On suspension scaffolds designed for a working load of 500 pounds, no more than two persons will be permitted to work at one time. On suspension scaffolds with a working load of 750 pounds, no more than three persons may work at one time. Each employee will wear an approved safety belt or harness attached to a lifeline. The lifeline will be securely attached to substantial members of the structure (not scaffold), or to secure rigged lines, which will safely suspend employee in case of fall.

Scaffolds (Tubular Welded Frame)

Scaffolds will be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally. Cross braces will be of such length as will automatically square and align vertical members so erected scaffold is plumb, square and rigid. AU brace connections will be made secure

Floor Openings, Open Sides, Hatchways, Etc.

Guard openings with a standard guardrail and toe boards or cover. Provide railing on all exposed sides, except at entrances to stairways.

Every open-sided floor or platform, 6 feet or more above adjacent floor or ground level, must be guarded by a standard railing or equivalent on all open sides where there is entrance to a ramp, stairway or fixed ladder.

Runways 4 feet high or more need standard railings on all open sides.

Guard ladder way floor openings or platforms with standard guardrails and standard toe boards on all exposed sides, except at entrance to opening, with passage through the railing provided by a swinging gate or offset so a person cannot walk directly into opening.

Temporary floor opening will have standard railings or effective covers.

Floor holes into which persons can accidentally walk will be guarded by either a standard railing with standard toe board on all exposed sides, or a standard floor hole cover.

While the cover is not in place, the floor hole will be protected by a standard railing.

Wall Openings

Wall openings, from which there is a drop of more than 4 feet and the bottom of opening is less than 3 feet above working surface, will be guarded. When the height and placement of the opening in relation to the working surface is such that a standard rail or intermediate rail will effectively reduce the danger of falling, one or both will be required. The bottom of a wall opening, which is less than 4 inches above the working surface, will be protected by a standard toe board or an enclosing screen.

Protection of the Public

All contractor personnel are charged with aiding in the protection of the public including, as your job description dictates, installation and maintenance of signs, signals, lights, fences, guardrails, ramps, temporary sidewalks, barricades, overhead protection, etc. as may be necessary.

Excavating and Trenching

Before opening any excavation, efforts (including utility company contact) must be made to determine if there are underground installations in the area. Underground utilities must be located and supported during excavation operations.

Walls and faces of trenches 5 feet or more in depth and all excavations in which employees are exposed to danger from moving ground or cave-in, must be guarded by shoring or sloping.

Where employees may be required to enter excavations, excavated material must be stored at least 2 feet from the edge of the excavation.

Appoint a competent person to make daily inspections of excavations. If evidence of possible cave-ins or slides is apparent, cease all work in the excavation until precautions have been taken.

Excavations over 20 feet deep must have shoring or sloping designed by a professional engineer. Trenches 4 feet deep or more require adequate means of exit such as ladders or steps, located so as to require no more than 25 feet of lateral travel.

Electrical-General

All extension cords must be 3-wire type, protected from damage, and not fastened with staples, hung from nails, or suspended from wires. No cord or tool with a damaged ground plug may be used. Splices must have soldered wire connections with insulation equal to the cable. Worn or frayed cables may not be used.

Except where bulbs are deeply recessed in a reflector, bulbs on temporary light will be equipped with guards. Temporary lights may not be suspended by their electric cords unless so designed.

Receptacles for attachment plugs will be of approved, concealed contact type. Where different voltages, frequencies or is of current are applied, receptacles must be such that attachment plugs are not interchangeable.

Each disconnecting means for motors and appliances, and each service feeder or branch circuit at point of origin must be legibly marked to indicate its purpose, unless located and arranged so that the purpose is evident.

No employee may work in proximity to any electric power circuit that may be contacted during the course of work, unless protected against electric shock by de-energizing circuit and grounding it or by guarding with effective insulation. In work areas where the exact location of underground electric power lines is unknown, workers using jackhammers, bars or other hand tools, which may contact electrical lines must wear insulated protective gloves.

Electrical - GFCI or Inspection Applicable to all Trades

15 and 20-ampere receptacle outlets on single-phase, 120-volt circuits for construction sites which are not a part of the permanent wiring of the building or structure, must be protected by either ground-fault circuit interrupters or an assured equipment grounding conductor program.

An assured equipment grounding conductor program covers all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and equipment connected by cords and plugs.

Inspect each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles that are fixed and not exposed to damage, before each days' use for external defects and possible internal damage. Remove from service or repair immediately any defective items.

Tests will be performed on all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and cord and plug-connected equipment required to be grounded. Grounding conductors will be tested for continuity. Each receptacle and attachment cap or plug will be tested for correct attachment of the equipment-grounding conductor.

Tests will be recorded. The test record must identify each receptacle, cord set, cord, and plug-connected equipment that passed the test, and will indicate the last date it was tested or the interval for which it was tested. No electrical tool or cord may be used unless it has been tested according to the company's assured grounding program. The non-current-carrying metal parts of fixed, portable and plug-connected equipment must be grounded, except those protected by an approval system of double insulation. The path from circuits, equipment, structures and conduit or enclosures to ground must be permanent and continuous and have ample current-carrying capacity.

Cranes or Derricks

Rated load capacities, recommended operating speeds and special hazard warnings or instructions must be conspicuously posted on all equipment. Instructions or warnings must be visible from the operator's station.

Accessible areas within swing radius of a crane must be barricaded to prevent employees from being struck or crushed by the crane.

Except where electrical distribution and transmission lines have been de-energized and visibly grounded, or where insulating barriers not a part of or an attachment to the equipment or machinery have been erected to prevent physical contact with the lines, no part of a crane or its load shall be operated within 10 feet of a line rated to 50kV or below; 10 feet + 4 inches for each 1kV over 50kV for Lines rated over 50kV or twice the length of the line insulator, but never less than 10 feet. Cranes will be inspected before each use by the operator. Any defects must be corrected before use. Logs of crane inspections must be kept with the crane.

EMERGENCY ACTION PLANS

Each project shall have a written Emergency Action Plan, which includes, but is not limited to, the following:

FIRE EMERGENCY PROCEDURE

- 1.) The foreman will take charge until the Superintendent or someone of authority arrives.
- 2.) Immediately notify the fire department of situation, location and type of fire. At this point all communication systems will be limited to emergency use only.
- 3.) The person in authority at the scene will designate someone to meet the Fire Department and direct them to the scene.
- 4.) Workmen will fight the fire with the best means available until the Fire Department arrives. In cases of heavy smoke or fumes, everyone will be evacuated. The Fire Department will take over on arrival.
- 5.) It is our moral and legal responsibility to do whatever we can to put out the fire while it is small. In doing so, do not risk injury to yourself or fellow workers.

INJURY EMERGENCY PROCEDURES

- 1.) The foreman will take charge until the Superintendent or someone of authority arrives.
- 2.) Immediately notify the ambulance service or medical facility of the location, type of accident, number of injured people, and any apparent need of rescue equipment. At this point, all communication systems will be limited to emergency use only. Notify the office.
- 3.) The person in authority will designate someone to meet the ambulance and direct them to the scene and block off the area to authorized personnel only.
- 4.) Emergency first aid will be administered immediately. The injured person is not to be moved unless further injury is imminent.
- 5.) Foremen are to keep all men away from the scene and to continue normal activities. They will remain alert for any requests for assistance.

**GRAHAM CONSTRUCTION COMPANY
GENERAL SAFETY RULES**

DISCIPLINARY PROCEDURES

For Violations of Safety Rules and Regulations

CONTRACTORS AND SUPPLIERS

- | | |
|-------------------------------------|---|
| 1.) First violation: | Re-instruction of proper procedure and a verbal Warning from job foreman or superintendent. |
| 2.) Second violation: | Written warning from superintendent; copies to the employee and employee's office. |
| 3.) Third violation: | Permanent removal from construction site |
| 4.) Irresponsible safety violation: | Immediate removal from construction site without any verbal or written warnings. |

**GRAHAM CONSTRUCTION NEAR MISS
SUBCONTRACTOR – ACCIDENT AND NEAR MISS
REPORT**

JOBSITE NAME: _____

CONTRACTOR : _____

DATE OF OCCURRENCE: _____

INJURED PERSON: _____

DESCRIPTION OF ACCIDENT OR NEAR MISS: _____

CORRECTIVE ACTION TAKEN: _____

Graham Construction Supervisor Signature: _____ **Date:** _____

Subcontractor Representative Signature: _____ **Date:** _____

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- B. Section 01 60 10 - Substitution Procedures
- C. Section 01 60 10.01 - Substitution Request Form

1.03 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- C. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is indicated in the documents.
 - 1. See Section 01 10 00 for list of items required to be salvaged for reuse and relocation.
 - 2. If reuse of other existing materials or equipment is desired, submit substitution request.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
 - 3. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions.

2. If wet-applied, have lower VOC content.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Result in less construction waste.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- C. See also Section 01 60 10 - Substitution Procedures.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 60 10 - Substitution Procedures for procedures for submitting equal products for consideration.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 1. Review Owner reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 60 10
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 21 13 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- D. Section 01 60 10.01 - Substitution Request Form

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.
 - 3. Substitutions for this project shall only consist of Equal products: The proposed products must have the same salient characteristics as the Basis of Design or other listed manufacturer or products, but were not listed as an acceptable manufacturer/product in specifications.
 - a. The named products and listed qualities in each section establish the salient features against which comparable products will be evaluated. Qualities may include type, function, dimension, in-service performance, physical properties, appearance, and other characteristics.
 - b. The Architect/Engineer will make the final determination of a proposed product as being equal.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

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

- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. All characteristics shall be compliant.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms included in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing the form provided in Section 01 60 10.01. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
 - 2. Substitution requests shall not be considered approved unless included by addendum.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Substitutions during construction will not be allowed, except for Cause (see definition above).
- B. Submittal Form:
 - 1. Submit substitution requests by completing the form provided in Section 01 60 10.01. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- D. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - a. Prior approval consists of a formal change document such as a Architects Supplemental Instruction, Construction Change Directive or Change Order. An approved and returned Substitution Request Form alone does not qualify.
 - 2. Without a separate written request, with proof of Cause.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.
 - 1. An approved and returned Substitution Request Form alone does not qualify.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 01 60 10.01
SUBSTITUTION REQUEST FORM

We hereby submit for your consideration the following product instead of the specified item for the following project:

PROJECT TITLE _____ PROJECT NO. _____

DRAWING NO. _____ DRAWING TITLE _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

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

Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

Substitutions of the materials and equipment described in the Contract Documents will be considered during the bidding period upon receipt or a written request to the Architect for approval up to five (5) days before receipt of bids. Verbal or written requests without the completed Substitution Request Form will not be considered.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance, and quality are equivalent or superior to the specified item.

Submitted by:

Signature

Firm

Address

Telephone Email Date

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

Fill in Blanks Below:

- A. Does the substitution affect dimensions shown on Drawings? Yes No

If yes, clearly indicate changes:

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

- C. What effect does substitution have on construction schedule?

D. Manufacturer's warranties of the proposed and specified items are:
_____ Same _____ Different (Explain on Attachment)

E. Reason for Request:

F. Itemized comparison of specified item(s) with the proposed substitution.
List significant variations:

G. Accurate cost data comparing proposed substitution with product specified:

H. Designation of maintenance services and sources:

(ATTACH ADDITIONAL SHEETS IF REQUIRED)

FOR USE BY DESIGN PROFESSIONAL:

_____ Recommended _____ Recommended as Noted

_____ Not Recommended _____ Received Too Late

Signed By _____

Date _____

FOR USE BY OWNER'S REPRESENTATIVE OR OWNER:

_____ Approved _____ Approved as Noted

_____ Not Approved _____ Approved Too Late

Signed By _____

Date _____

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties .
- G. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- H. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Engineer before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Engineer, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.

- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

- A. For surveying work, employ a professional engineer registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

- A. Protect site from puddling or running water.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from accessing or invading premises.
- F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.

- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect five days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that established by Owner provided survey.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and roof elevations.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.

- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 10 00 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 - 2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work tightly to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

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

- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site weekly and dispose off-site; do not burn or bury.

3.09 PROTECTION OF EXISTING AND INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
 - 1. Minimum protection to include the following:
 - a. One layer of 1/4 inch thick fanfold board ("Amocor"PB4" by Amoco or equal) laid directly over roof.
 - b. One layer of nominal 1/2 inch thick exterior plywood or exterior OSB board laid over fanfold board. Provide suitable ballast to maintain position and preclude blow-off. Do not overload structure.
 - 2. After completion of work operations on roof, remove temporary protection, restore roof to pre-construction condition, and repair damage to roof, if any; see below.
 - a. Damage/Warranties: Damage to existing roofing due to operations under this Contract to be repaired as required by roofing membrane manufacturer without reduction in Owner's warranty provisions and rights:
 - b. All costs associated with repairs and warranty reinstatements, if any, to be borne by the Contractor who caused the damage.
 - c. Existing Warranties: Coordinate with Owner for areas of roof which carry existing warranty; repairs in these areas, if any, to be made by original installer.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

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

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.12 ADJUSTING

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

3.13 FINAL CLEANING

- A. Execute final cleaning prior to Substantial Completion.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.
- G. Clean debris from roofs and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- J. Clean Owner-occupied areas of work.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Contractor and/or Owner on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 30 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form prior to final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.

- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 2. Field changes of dimension and detail.
 - 3. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Include test and balancing reports.
- N. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Original warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes, excluding removal of hazardous materials and toxic substances.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Sequencing and staging requirements.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- F. Section 07 01 50.19 - Preparation for Re-Roofing

1.03 DEFINITIONS

- A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 PERMITS

- A. Contractor shall comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.
- B. Contractor shall obtain and pay for all required inspections, sampling, analytical costs, permits, and fees. Provide notices required by governmental authorities.

1.07 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Areas for temporary construction and field offices.
 - 2. Areas for temporary and permanent placement of removed materials.

- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Summary of safety procedures.
 - 3. Schedule of demolition activities with starting and ending dates for each activity.
 - 4. Include measures for environmental protection, for dust control, and for noise control.
 - 5. Detail special measures proposed to protect adjacent buildings or spaces to remain including means of egress.
- D. Inventory of items that have been removed and salvaged.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.08 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

1.09 FIELD CONDITIONS

- A. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. On-site storage or sale of removed items or materials is not permitted.
- E. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings or spaces.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all materials necessary to safely demolish and remove items indicated.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Remove portions of existing building as indicated in demolition plans and as required to accomplish new work.
- B. Remove items indicated, for salvage and reinstallation.
 - 1. Existing ballast, near tie-in.

3.02 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with requirements in Section 01 70 00.

- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Provide, erect, and maintain temporary barriers and security devices.
 - a. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.
 - b. Protect on-site trees and plants noted on Plans and all off-site trees and plants from damage.
 - c. Protect existing objects designated to remain, and in the event of damage, immediately make repairs or replacements necessary to the approval of the Owner's Representative at no additional cost to the Owner.
 - 5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - a. Remove temporary barriers and protections where hazards no longer exist.
 - b. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.
 - 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- F. Verify weight capacity and path of use for equipment with Project Coordinator and Design Team prior to work.
- G. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- H. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

3.04 EXISTING UTILITIES

- A. Protect existing utilities to remain from damage.
- B. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 7 days prior notification to Owner.

- D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- F. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Cooperate with the Owner and Authorities Having Jurisdiction to provide Interim Life Safety Measures (ILSM) in all areas affected by demolition or construction operations.
 - 1. Ensure exits provide an unobstructed egress. Building areas under construction must maintain escape facilities for construction workers at all times. Provide alternate routes around closed or obstructed traffic-ways if required by authorities having jurisdiction.
 - 2. Ensure fire alarm, detection and suppression systems are not impaired. Provide temporary systems if necessary.
 - 3. Ensure temporary construction partitions are smoke-tight and built of non-combustible or limited combustible materials that will not contribute to the development or spread of fire.
 - 4. Develop and enforce storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations as stated in the general conditions.
 - 5. Provide hazard surveillance of building, grounds, and equipment with attention to construction areas, construction storage, and field offices.
 - 6. Follow NFPA 241 guidelines pertaining to safe-guarding for construction and demolition processes.
 - 7. Follow NFPA 1 guidelines pertaining to fire prevention measures.
- C. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction of 1-hour rated construction, fully finished faces where exposed to public view .
- D. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- E. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Inventory and record the condition of items to be removed and salvaged.
- F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. See Section 01 10 00 - Summary for limitations on outages and required notifications.
 - 4. Verify that abandoned services serve only abandoned facilities before removal.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

- G. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

3.06 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 4. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 5. Project Coordinator will provide dumpster and coordinate with waste hauler for drop off and pick-up.
 - 6. Dumpster to be located as agreed upon at Pre-Bid meeting or by Owner.
- B. Remove materials not to be reused on site; do not burn or bury.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each product type.
- B. Design Mixtures: For each concrete mixture
- C. Shop Drawings:
 - 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each product, signed by manufacturers.
- B. Material Test Reports: For each product, from a qualified testing agency:
- C. Preconstruction Test Reports: For each mix design.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.
- F. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.07 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.09 STEEL REINFORCEMENT

- A. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- B. Headed-Steel Reinforcing Bars: ASTM A970/A970M.
- C. Galvanized Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
- D. Epoxy-Coated Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
 - 2. Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.
- E. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

- G. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
 - H. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, steel.
- 1.10 FIELD CONDITIONS**
- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
 - B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.
- PART 2 - PRODUCTS**
- 2.01 CONCRETE, GENERAL**
- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.
- 2.02 CONCRETE MATERIALS**
- A. Cementitious Materials:
 1. Portland Cement: ASTM C150/C150M, Type I.
 2. Fly Ash: ASTM C618, Class C or F.
 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 4. Blended Hydraulic Cement: ASTM C595/C595M, cement.
 - B. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
 2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - C. Air-Entraining Admixture: ASTM C260/C260M.
 - D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - E. Water and Water Used to Make Ice: ASTM C94/C94M, potable
- 2.03 RELATED MATERIALS**
- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
 - B. Floor Slab Protective Covering: Eight-feet-wide cellulose fabric.
- 2.04 CONCRETE MIXTURES, GENERAL**
- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
 - B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
 3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
 - C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
- 2.05 CONCRETE MIXTURES**
- A. Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum w/cm: 0.40.
3. Slump Limit: 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
4. Air Content:
 - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery.

2.06 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

PART 3 - EXECUTION

3.01 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.02 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness.
- D. Isolation Joints in Slabs-on-Ground: 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.
- E. Doweled Joints:
 1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.03 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

3.04 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
- B. Related Unformed Surfaces:
 - 1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
 - 2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.05 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish:
 - 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 - 2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
 - 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 4. Do not add water to concrete surface.
 - 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 - 6. 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.
 - 7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

3.06 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 - 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 - 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 - 3. 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. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.07 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.

3.08 TOLERANCES

- A. Conform to ACI 117.

3.09 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.
 - 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 - 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. Slump: ASTM C143/C143M:
 - 3. Slump Flow: ASTM C1611/C1611M:
 - 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.
 - 5. Concrete Temperature: ASTM C1064/C1064M:
 - 6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - 7. Compression Test Specimens: ASTM C31/C31M:
 - 8. Compressive-Strength Tests: ASTM C39/C39M.
 - 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 - 11. 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.
 - 12. Additional Tests:
 - a. 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.
 - 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.10 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION

SECTION 03 30 13
CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Accessories, including:
 - 1. Joint devices.
 - 2. Drainage mat.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 54 00 - Thermoplastic Membrane Roofing: Waterproofing layer below concrete slab; coordination for compatibility.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

PART 2 PRODUCTS

2.01 ACCESSORY MATERIALS

- A. Drainage Composite: Nonwoven filter fabric bonded to individual dimples of molded polypropylene core to minimize fabric intrusion of flow channels, 0.4 inch thick; provide type recommended by sheet waterproofing manufacturer for application indicated.
 - 1. Width: 4 feet, minimum.
 - 2. Compressive Strength: 21,000 psi minimum
 - 3. Product:
 - a. Carlisle Coatings & Waterproofing Inc; MiraDRAIN 9000 - Horizontal.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Waterstops: Bentonite and butyl rubber; One edge is layered with a pressure sensitive adhesive
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
 - 3. Products:
 - a. Tremco: Superstop
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

3.03 PLACING CONCRETE

- A. Ensure waterstops and drainage panels will not be disturbed during concrete placement.

END OF SECTION

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim: Coordination.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood.
- E. PS 1 - Structural Plywood.
- F. PS 20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on panel products.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Engineered wood products containing added urea-formaldehyde are not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.

- C. Fire-retardant treated.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 1 or Construction Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Concealed Backing for wall-mounted items- provide backing as required for loading from one of the following:
 - 1. All blocking and backing to be fire-retardant treated.
 - 2. Dimension Lumber: as noted above
 - 3. Plywood: as noted below
- B. Other Applications:
 - 1. Fire-retardant treated.
 - 2. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 3. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 4. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
- C. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with masonry or concrete.
 - d. Treat lumber less than 18 inches above grade.
 - e. Treat lumber in other locations as indicated.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with masonry or concrete.
 - c. Treat plywood less than 18 inches above grade.
 - d. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.05 CLEANING

- A. Waste Disposal:
 1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Partial replacement of existing roofing system (primarily coverboard and membrane) in preparation for replacement roofing system in designated areas as indicated on drawings.
- B. Temporary roofing protection.

1.02 RELATED REQUIREMENTS

- A. Section 02 41 00 - Demolition: disposal of materials
- B. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
- C. Section 07 54 00 - Thermoplastic Membrane Roofing
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.03 REFERENCE STANDARDS

- A. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.
- D. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with affected mechanical and electrical work associated with roof penetrations.
- B. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Attendees:
 - a. Contractor.
 - b. Owner.
 - c. Installer.
 - d. Roofing system manufacturer's field representative.
- C. Meet at Project site with the following attendees:
 - 1. Construction Manager or General Contractor
 - 2. Roofing Installer
 - 3. Installers of deck or substrate construction to receive roofing work,
 - 4. Installers of rooftop equipment and other associated work that must precede or follow roofing work
 - 5. Architect
 - 6. Owner or Owner's construction representative
 - 7. Roofing system manufacturer's representative
 - 8. Additional installers of any associated work
- D. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 1. Review methods and procedures related to roofing work.
 - 2. Review structural loading or penetration limitations of deck.
 - 3. Verify new equipment will fit existing penetrations and roof curbs or what modifications need to occur for new equipment.
 - 4. Review roofing systems requirements and compliance with NRCA standards.
 - 5. Review required submittals, both completed and yet to be completed.

6. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 7. Review required inspection, testing, certifying, and material usage accounting procedures.
 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including provision of temporary roofing.
 9. Record discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- E. Schedule work to coincide with commencement of installation of new roofing system.

1.05 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, insulation, surfacing, and fasteners used for patching existing membrane.
- B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with existing materials.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- B. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- C. Store products in weather protected environment, clear of ground and moisture.
- D. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

- A. Existing Roofing System: EPDM single-ply roofing.
- B. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.
- C. Remove only existing roofing materials that can be replaced with new materials the same day.
- D. Coordinate the work with other affected trades and building occupants.
- E. Coordinate with roof accessories and sheet metal accessory items, including other devices to be coordinated with the roofing work as specified in other sections to avoid conflict or omission in waterproofing systems and to provide watertight installation.
- F. Maintain continuous temporary protection prior to and during installation of new roofing system.
- G. Owner will occupy building areas directly below re-roofing area.
 1. Provide Owner with at least 72 hours written notice of roofing activities that may affect their operations and to allow them to prepare for upcoming activities as necessary.
 2. There may be areas where the Owner's operations or activities cannot be interrupted.
 3. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Existing Warranties: Perform this work using methods and materials that will maintain existing roof system warranties.

1. Notify existing roof system warrantor prior to starting this work and obtain written instructions for procedures necessary to maintain this existing warranty.
 2. Upon completion of this work, notify warrantor of reroofing completion and obtain documentation to verify that existing roofing system has been inspected and warranty is still in effect.
 - a. Submit documentation upon project closeout.
- C. New membrane to meet warranty as described in 07 53 00.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. See the following sections for additional information on components relating to this work:
1. Replacement and removal of existing roofing system in preparation for entire new roofing system, see Section 07 53 00.

2.02 MATERIALS

- A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.
- B. Temporary Protection: Sheet fiber reinforced plastic; provide weights to retain sheeting in position.
1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

- A. Sweep roof surface clean of loose matter.
- B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

- A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.
- B. Fold up metal counter flashings to permit access to top edge of base flashings.
- C. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.
- D. Remove damaged or wet insulation and fasteners,, and coordinate scope with Project Coordinator for tracking against allowance.

3.04 INSTALLATION

- A. Coordinate scope of this work with requirements for installation of new roofing system, refer to Section 07 54 00 for additional requirements.
- B. Provide manufacturer approved transitions where new roof meets existing roof.

3.05 PROTECTION

- A. Provide protection of existing roofing system that is not having work performed on it.
- B. Provide temporary protective sheeting over uncovered deck surfaces.
- C. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.
- D. Provide for surface drainage from sheeting to existing drainage facilities.
- E. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION

SECTION 07 19 00
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to exterior, concrete surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCE STANDARDS

- A. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.
 - 2. Extra Water Repellent Material: Two gallons of type installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience
- C. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.06 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 40 degrees F or higher than 100 degrees F.
- C. Do not apply water repellents when wind velocity is higher than ___ mph.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Heavy-traffic horizontal surfaces as indicated.
 - 2. Number of Coats: Two.
 - 3. Moisture Absorption When Applied to Concrete: Five percent, maximum, when tested in accordance with ASTM C642 concrete sample completely coated with water repellent.
 - 4. Solvent-based silane, siloxane, silane-siloxane blend, or silicate that reacts chemically with concrete and masonry.
 - a. Manufacturers:
 - 1) **BASIS OF DESIGN:** TK Products: TK-Tri-Siloxane 290; www.tkproducts.com
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Protection of Adjacent Work:
 - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until concrete substrate is cured, typically 14 to 28 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- F. Scrub and rinse surfaces with water and let dry.
- G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at split-slabs.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete
- B. Section 07 54 00 - Thermoplastic Membrane Roofing: Insulation specified as part of roofing system.

1.03 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation at Concrete Split-Slabs: Polyisocyanurate (ISO) board.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 2, glass fiber-reinforced core.
 - 1. Classifications:
 - a. Type I (Typical): Faced with aluminum foil on both major surfaces of core foam.
 - 1) Class 2 - Glass fiber reinforced or non-reinforced core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum
 - 3) Thermal Resistance: nominal R-value of 6 per inch.
 - b. Type II (Near Door): Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
 - 2) Compressive Strength: Class 4, Grade 1 - 80 psi (551 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
 - 4) Thermal Resistance: nominal R-value of 5.8 per inch.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Comply with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 5. Board Size: 48 inch by 96 inch.
 - 6. Board Thickness: as indicated in wall types and details

7. Board Edges: Square.
8. Products:
 - a. Atlas Roofing Corporation; AC Foam Supreme Polyiso Roof Insulation: www.atlasroofing.com/.
 - b. Carlisle Coatings & Waterproofing, Inc; R2+ Silver: www.carlisleccw.com/#sle.
 - c. Hunter Panels; Xci Foil (Class A): www.hunterpanels.com/#sle.
 - d. **BASIS OF DESIGN:** Rmax Inc; R-Matte Plus-3: www.rmax.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FOAMED-IN-PLACE INSULATION

- A. Shim Space Insulation: Polyurethane type, single component spray foam system, reduced expansion spray foam system; semi-rigid; closed cell.
 1. Application: Fill shim spaces around openings, for sealing seams in board insulation within the joint, and joints greater than 1/8" between furring and insulation. NOT to be used at curtainwall shim space.
 2. Thermal Value (R), Minimum: 4.50 per inch, when tested in accordance with ASTM C 518.
 3. Density: 1.3 lb/cu ft, when tested in accordance with ASTM D 1622.
 4. Flame Spread: 20, when tested in accordance with UL 1715 Fire Test.
 5. Smoke Development: 25, when tested in accordance with UL 1715 Fire Test.
 6. Product:
 - a. Convenience Products: "Touch 'n Seal No-Warp Foam".
 - b. Hilti: "CF 812 Window and Door Pro Low-Pressure Filler Foam".
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Weather Barrier: See Section 07 27 00 - Air Barriers.
- B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 2. Width: Are required for application.
 3. Temperature Resistance: Range of minus 40 to 212 degrees F.
- C. Tape joints of rigid insulation in accordance with insulation manufacturers' instructions.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by manufacturer.
 1. Length as required for thickness of insulation material and penetration of substrate, with plastic washers.
- E. Adhesive: Type recommended by insulation manufacturer for application.
 1. Must show compatibility with adjacent products.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.
- C. Verify substrate materials are compatible with insulation & adhesives.

3.02 PREPARATION

- A. Spray Foam:
 1. Mask and protect adjacent surfaces from over spray or dusting.
 2. Apply primer in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Apply adhesive to back of boards:

1. Three continuous beads per board length.
- B. Install boards horizontally on foundation perimeter.
 1. Place boards to maximize adhesive contact.
 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate at frequency recommended by manufacturer.
- B. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 1. Extend sheet full height of joint.
- C. Apply adhesive to back of boards:
 1. Three continuous beads per board length.
- D. Install boards to fit snugly between wall ties.
- E. Install boards horizontally on walls.
 1. Place boards to maximize adhesive contact.
 2. Install in running bond pattern.
 3. Butt edges and ends tightly to adjacent boards and protrusions.
 4. Place impale fastener locking discs.
- F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.06 SPRAY FOAM INSULATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids. Do not exceed manufacturer's recommended thickness per application.
- C. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- D. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.07 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 24 00
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Infill/patching of existing EIFS:
 - 1. Composite wall cladding of rigid insulation and reinforced finish coating, "Class PB".

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.

1.03 REFERENCE STANDARDS

- A. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- C. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage.
- D. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
- E. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity.
- F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- I. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies.
- J. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS).
- K. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- L. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials.
- M. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems.
- N. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies.
- O. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.
- P. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- Q. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall joint patterns, joint details, and molding profiles.

- D. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures proposed to match existing.
- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

- A. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
 - 1. Member in good standing of EIMA (EIFS Industry Members Association).
 - 2. Manufacturer of EIFS products for not less than 5 years.
- B. Installer Qualifications: Company approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.
 - 1. Protect adhesives and finish materials from freezing, temperatures below 40 degrees F and temperatures in excess of 90 degrees F.
 - 2. Protect insulation materials from exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.
- E. Protect installed EIFS areas from inclement weather until dry.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: as required to match existing, from the following:
 - 1. Master Builders Solutions; www.senergy.master-builders-solutions.com
 - 2. Dryvit Systems, Inc; Dryvit Outsulation Plus MD Exterior Insulation and Finish System, Class PB with Moisture Drainage; www.dryvit.com/sle.
 - 3. Master Wall, Inc; www.masterwall.com
 - 4. Parex USA, Inc; www.parex.com
 - 5. Sto Corp: www.stocorp.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on flat-backed insulation board adhesive-applied directly to water-resistive coating over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.
- B. System Description: provide components as required to patch existing, which may consist of:
 - 1. Air and Water-Resistive Membrane Barrier (as necessary to provide complete WRB)
 - 2. Accessory Materials

3. Adhesive – installed in vertical ribbons to facilitate egress of incidental moisture
 4. Expanded Polystyrene (EPS) insulation board
 5. Base Coat
 6. Reinforcing Mesh
 7. Finish Coat
 8. Joint Sealants
- C. Fire Characteristics:
1. Flammability: Pass, when tested in accordance with NFPA 285.
 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
 3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot.
- D. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi, when tested in accordance with ASTM C297/C297M.
- E. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi in all samples.
- F. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
- G. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- H. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.
- I. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- J. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- K. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- L. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.
- M. Impact Resistance: Construct system to provide the following impact resistance without exposure of broken reinforcing mesh, when tested in accordance with ASTM E2486/E2486M:
1. Standard: 25 to 49 in-lb, for areas inaccessible to public.
 2. Medium: 50 to 89 in-lb, for areas indicated on drawings and all locations within 8-feet of finish grade or traffic surfaces.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic finish with integral color and texture.
1. Provide manufacturer's premium coating with enhanced soiling and mildew resistance.
 2. Texture: Sandpebble Fine.
 3. Color: As selected by Architect from manufacturer's full range, to match existing.

- B. Primer(s): Acrylic based coating to prepare surfaces for finishes.
- C. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh, Class PB.
- D. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
 - 1. Provide for ultra high impact mesh assembly including Panzer 15 mesh for all EIFS clad wall areas within 8'-0" of grade and where additionally indicated on contract drawings.
- E. Insulation:
 - 1. To match existing at infill, patching or replacement areas, most likely:
 - 2. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578, Dryvit Specification DS131 and ASTM E 2430.
 - a. Grooved Board: Back side of board adjacent to sheathing grooved with vertical channels designed to allow moisture to drain; at drainage points provide board configuration that permits drainage to the exterior.
 - b. Board Size: As recommended by EIFS finish manufacturer.
 - c. Board Thickness: 5 inches, unless otherwise indicated on drawings.
 - 1) See drawings for detail areas where thickness may vary.
 - d. Compressive Resistance: 10 psi (69 kPa), minimum
 - e. Board Density: 1.00 pcf, minimum
 - f. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, when tested in accordance with ASTM E84.
- F. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.
 - 1. Permeable
- G. Water-Resistive Barrier Coating Accessories: Provide compatible accessory materials as required by project conditions for substrate, rough opening and penetration preparation, bridge expansion joints in substrate, material transitions and flashing integration to produce a complete air and water-resistant assembly.

2.04 ACCESSORIES

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Metal Flashings: See Section 07 62 00.
- C. Trim / Drainage Components: EIFS manufacturer's standard PVC trim accessories, as required for a complete project and including starter track and drainage accessories.
- D. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.
 - 1. Polyurethane Sealant: A one component hybrid polyurethane sealant.
 - a. Coordinate for primer use as indicated.
- E. Portland Cement: verify is Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.
- F. Water: verify is clean and free of foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.

- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.
- C. Verify the deflection of the substrate does not exceed 1/240 times the span. Verify substrate is flat within 1/4 in (6.4 mm) in a 4 ft (1.2 m) radius.
- D. Verify metal flashings have been installed in accordance with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards.
- E. Verify all rough openings are flashed in accordance with the EIFS manufacturer's installation details, or as otherwise necessary to prevent water penetration.

3.02 PREPARATION

- A. Protect surrounding material surfaces and areas during installation of system.
- B. Clean surfaces thoroughly prior to installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
 1. Where different requirements appear in either document, comply with the most stringent.
 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.04 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Mechanically attach sheet materials to substrate using fasteners and fastener spacing recommended by EIFS manufacturer.
- C. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- D. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- E. At moving expansion joints, apply flexible flashing or flashing tape across and recessed into joint with U-loop forming continuous barrier but allowing movement.
- F. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.
- G. Install drainage layer or spacers after flashing tape has been completed.

3.05 INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Prior to installation of boards, install starter track and other trim level and plumb and securely fastened. Install only in full lengths, to minimize moisture intrusion; cut horizontal trim tight to vertical trim.
- C. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- D. On wall surfaces, install boards horizontally.
- E. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.
- F. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.
- G. Rasp irregularities off surface of installed insulation board.

- H. Adhesive Attachment: Use method required by manufacturer to achieve drainage efficiency specified; do not close up drainage channels when placing insulation board.

3.06 INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. At locations within 8 feet of grade, install second layer of reinforcing mesh embedded in second coat of base coating, tightly butting ends and edges of mesh.
- C. Install expansion joints at locations as recommended by EIFS manufacturer. As a minimum, expansion joints shall be placed at the following locations:
 - 1. Where expansion joints occur in the substrate system
 - 2. Where building expansion joints occur
 - 3. At floor lines of non-wood framed buildings where significant movement is expected
 - 4. Where the EIFS abuts dissimilar materials
 - 5. Where the substrate type changes
 - 6. Where significant structural movement occurs, such as changes in roof line, building shape or structural system
- D. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- E. Finish Coat Thickness: As recommended by manufacturer.
- F. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.
- G. Apply sealant at finish perimeter and expansion joints in accordance with Section 07 92 00 - Joint Sealants.

3.07 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

3.08 PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane (TPO).
- B. Insulation, flat and tapered.
- C. Cover boards.
- D. Flashings.
- E. Roofing stack boots and walkway pads.
- F. Roof pavers.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
- B. Section 07 01 50.19 - Preparation for Re-Roofing: patching penetrations and making tie-ins to existing roof membrane.
- C. Section 07 21 00 - Thermal Insulation: Rigid insulation at split-slabs.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings and drainage components.
- E. Section 07 71 00 - Roof Specialties: Prefabricated copings.
- F. Section 22 10 06 - Plumbing Piping Specialties: Roof drains and sumps.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Allowances:
 - 1. See Section 01 21 00 - Allowances for allowances affecting this section.
 - 2. Include cash allowance for replacement of insulation if found to be damaged or wet.

1.04 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
- E. ASTM E303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
- F. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- G. NRCA (RM) - The NRCA Roofing Manual.
- H. NRCA (WM) - The NRCA Waterproofing Manual.
- I. UL (FRD) - Fire Resistance Directory.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Attendees:
 - a. Design Professional.
 - b. Contractor.
 - c. Operator.
 - d. Installer.

- e. Roofing system manufacturer's field representative.
- f. Inspection and Testing Agency Representatives.
- 2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
 - a. Installation schedule.
 - b. Necessary preparatory work.
 - c. Installation of roofing system.
 - d. Insulation fastening patterns for desired wind uplift ratings in accordance with membrane roofing manufacturer's instructions for roof field, perimeter, and corners.
 - e. Transitions and connection to and with other work.
 - f. Coordination of expansion joint materials with wall expansion joints.
 - g. Inspections and testing of installed systems.
 - h. Protection of installed membrane roofing.
- 3.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.
 - 1. Submit for every component of the system.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and paver layout.
- D. Samples: Submit two samples of each component of the roofing system (membrane, fasteners, plates, bars, insulation, etc.)
- E. Samples of Pavers: Submit two.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.
 - 3. State all exclusions, limitations, obligations and remedies.
- H. Project Record Documents: Record changes from the contract documents at completion of project.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least five years of experience and approved by manufacturer.
 - 1. Roof Foreman and 50 percent of installing crew are trained and certified in the installation of specified roofing system.
 - 2. Foreman shall be full-time, at project site, through roof completion.
- C. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and an experienced superintendent on the job at all times roofing work is in progress.
- D. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
 - 1. Provide additional protection beyond manufacturers standard packaging.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.
- E. Provide breathable protective coverings to prevent condensation and moisture accumulation. May require additional protection beyond manufacturers standard packaging.
- F. No storage allowed at locations of new roofing installations.
- G. Store rolled goods on ends only. Discard rolls which have been flattened, creased or otherwise damaged.
- H. Remove damaged or contaminated materials or opened containers from site as soon as possible.

1.09 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 100 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.
- F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.
- G. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.
- H. Ensure that drains are operational at end of each workday or if precipitation is forecast.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. Limit of Liability: No dollar limitation, non-prorated.
 - 3. For repair and replacement include costs of both material and labor in warranty.
 - 4. Exceptions are not Permitted:
 - a. Damage due to wind speeds up to 90 mph.
- C. Provide 5 year installation warranty, certified on a form furnished by the Owner. Warranty shall include:
 - 1. Roofing membrane
 - 2. Flashing and counter-flashing
 - 3. Insulation and cover board
 - 4. Fasteners and adhesives
 - 5. Sealants and caulking
 - 6. Walkway mats and pavers
 - 7. Roofing accessories, as required, making a complete roofing system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlisle-syntec.com/sle.
 - 2. Firestone Building Products, LLC; UltraPly: www.firestonebpco.com.
 - 3. GAF; EverGuard TPO: www.gaf.com/sle.
 - 4. GenFlex Roofing Systems, LLC; GenFlex TPO: www.genflex.com.
 - 5. Mule-Hide Products: www.mulehide.com
 - 6. Versico, a division of Carlisle Construction Materials Inc; VersiWeld TPO: www.versico.com/sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
 - a. Field applied coating may not be used to achieve specified SRI.
 - 2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
 - 3. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 4. Uplift Pressures: as indicated in Structural Drawing Notes.
 - 5. Air tightness: 0.04 CFM/SF, maximum, when subjected to a uniform static air pressure of 1.57 psf.
 - 6. Insulation Thermal Value (R), minimum: 30; provide insulation of thickness required.
 - a. Provide required thickness in a minimum of 2 layers.
 - b. Provide minimum R-value specified at roof drains in fully tapered areas.
 - 7. Drainage: No standing water within 48 hours after precipitation.
- C. Acceptable Insulation Types - Constant Thickness Application:
 - 1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application:
 - 1. Tapered polyisocyanurate board covered with uniform thickness polyisocyanurate board.
 - 2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
 - a. Thickness: 60 mil, 0.060 inch.
 - 1) Provide 80 mil (0.080 inch) under concrete pad areas.
 - 2. Sheet Width: Factory fabricated into widest possible sheets.
 - 3. Color: White.
 - 4. Physical Properties:
 - a. Breaking Strength: 300 lbf; ASTM D 751, grab method.
 - b. Elongation at Break: 25 percent; ASTM D 751.
 - c. Tearing Strength: 55 lbf minimum; ASTM D 751, Procedure B.
 - d. Brittleness Point: Minus 40 deg F.
 - e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F and an ozone level of 100 pphm; ASTM D 1149.

- f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F; ASTM D 573.
 - g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F; ASTM D 471.
 - h. Linear Dimension Change: Plus or minus 1 percent; ASTM D 1204.
- B. Seaming Materials: As recommended by membrane manufacturer.
 - C. Flexible Flashing Material: Same material as membrane.
 - D. Base Flashing: Waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations.

2.04 COVER BOARDS

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
 - 1. Thickness: 1/2 inch, fire-resistant.
 - 2. Products:
 - a. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell FA Glass Mat Roof Board: www.goldbondbuilding.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 INSULATION

- A. Scope: Replacement of existing insulation where damaged or wet (See Section 01 21 00 - Allowances).
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
 - 1) Class 2 - Glass fiber reinforced or nonreinforced core foam..
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum
 - 3) Thermal Resistance: nominal R-value of 6 per inch.
 - 2. Board Size: 48 by 96 inches.
 - 3. Board Thickness: 2.0 inch, minimum per layer; overall thickness as indicated in Roof Assembly Type and as required to match existing.
 - 4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
 - 5. Board Edges: Square.
- C. Prefabricated / Pre-Cut Crickets: hinged triangular one-piece pre-cut tapered and fill panels; made from closed-cell polyisocyanurate foam core integrally bonded to non-asphaltic, glass fiber reinforced organic felt or inorganic coated-glass facers.
 - 1. Contractor to select panels based on installation conditions.

2.06 ROOF PAVERS SYSTEMS

- A. Precast Concrete Roof Pavers: Precast concrete tiles, with texture and color as indicated.
 - 1. Material: porcelain.
 - 2. Comply with local wind load resistance requirements of ASCE 7.
 - 3. Texture: Standard Finish.
 - 4. Width: Walkway to be 24 inches wide minimum, provide paver configuration as necessary.
 - 5. Thickness: 1-3/4 inches, 2-1/4 inches at feet.
 - 6. Weight: 24 lb per sq ft, nominal.
 - 7. Color: as selected by Architect from manufacturer's full range.
 - 8. Slip Resistance: Provide walking surfaces of exterior pavers with Pendulum Test Value (PTV) of at least 40 in accordance with ASTM E303 test method.
 - 9. Provide paver mat when recommended by manufacturer.
 - 10. Products:
 - a. Elevate: SkyScape Ballast Paver; www.holcimelevate.com

- b. **BASIS OF DESIGN:** Hanover Pedestal Pavers
- c. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.
- C. Insulation and Coverboard Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- F. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- G. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.
- H. Termination Bars: Stainless steel bars, 1 inch wide by 1/8 inch thick, pre-punched at 4 inches oc for fastening to substrate.
- I. Sealants: As recommended by membrane manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, slip sheet, and other accessories, as required for a complete installation.
- K. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Roofing membrane manufacturer's standard, with embossed surface.
 - 2. Configuration: rolls
 - 3. Size: Manufacturer's standard size.
 - 4. Surface Color: as selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of roofing system:
 - 1. Verify that surfaces and site conditions are ready to receive work.
 - 2. Verify deck is supported and secure.
 - 3. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
 - 4. Verify deck surfaces are dry and free of snow or ice.
 - 5. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips, nailing strips, and reglets are in place.

3.02 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.03 INSULATION APPLICATION

- A. Attachment of Insulation:
 - 1. Mechanically fasten insulation to concealed deck in accordance with roofing manufacturer's instructions.
- B. Butt boards tightly. Fill gaps exceeding 1/4 inch with insulation.
- C. Maintain pressure on the boards until adhesive cures.
- D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- H. Do not install more insulation than can be covered with membrane in same day.

3.04 COVER BOARD INSTALLATION

- A. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and to meet performance requirements specified.

3.05 INSTALLATION - MEMBRANE

- A. Apply membrane roofing system in accordance with manufacturer's recommendations and NRCA (RM) applicable requirements.
- B. Coordinate work with installation of associated counterflashings, expansion joints, penetrations and wall modifications installed by other sections as the work of this section proceeds.
- C. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
 - 1. Allow membrane to relax for a minimum of 30 minutes or as recommended by the manufacturer prior to installing.
- D. Shingle joints on sloped substrate in direction of drainage.
- E. Fully Adhered Application: Apply adhesive to substrate at rate of manufacturer's recommended gal/sq ft. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- F. Overlap edges and ends and seal seams by heat welding, minimum 1.5 inches. Seal permanently waterproof.
- G. At intersections with vertical surfaces:
 - 1. Extend membrane up a minimum of 8 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strip, reglet or termination bar as detailed.
 - a. Secure termination bars at 8" o.c. to substrate. Include elastomeric tape between term bar and membrane.
- H. Around roof penetrations, seal flanges and flashings with flexible flashing.
- I. Coordinate installation of roof drains and sumps and related flashings.
- J. Install roof membrane or flexible roof flashing to air barrier material in wall construction, lap and seal to provide continuity of the air barrier plane.

3.06 INSTALLATION - WALKWAY PADS

- A. Install walkway pads. Space pad joints to permit drainage.

- B. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.07 INSTALLATION - PAVERS

- A. Install pavers in accordance with manufacturer's instructions.
 - 1. Fully support edges; shim and adjust pavers to provide level surface.
 - 2. Provide approximately 1/4-inch space between pavers to permit surface water drainage.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.
- C. Seam testing: to evaluate seam integrity.
- D. Provide warranty review of membrane prior to concrete pad being poured on top.

3.09 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and conductor heads.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 07 53 00 - Elastomeric Membrane Roofing
- C. Section 07 71 00 - Roof Specialties: Manufactured copings.
- D. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- D. CDA A4050 - Copper in Architecture - Handbook.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 3 by 5 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sheet Metal Flashing and Trim:
 - 1. Elevate: UnaClad; www.holcimelevate.com
 - 2. Petersen Aluminum Corporation; Pac-Clad: www.pac-clad.com/sle.

3. Ryerson: ColorKlad/AlumaKlad; www.ryerson.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with fluoropolymer coating.
 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.
 2. Color: As selected by Architect from manufacturer's full colors.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, continuous, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.04 DRAINAGE COMPONENTS

- A. Conductor Heads: Match existing profile.

2.05 ACCESSORIES

- A. General: 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.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolt, and other suitable fasteners designed to withstand design loads.
 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed with hex washer heads.
 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 4. Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws. Use stainless steel fasteners.
- C. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.
- D. Primer Type: Zinc chromate.
- E. Protective Backing Paint: Zinc molybdate alkyd.
- F. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- G. Concealed Sealants: Non-curing butyl sealant.
 1. See Section 07 92 00 for additional information.
- H. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
 1. See Section 07 92 00 for additional information.
- I. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Conform to drawing details:
 - 1. Counterflashings: SMACNA Architectural Sheet Metal Manual, Detail 4-4C.
- B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings.

1.02 RELATED REQUIREMENTS

- A. Section 07 54 00 - Thermoplastic Membrane Roofing
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: other prefinished metal flashing and trim components.

1.03 REFERENCE STANDARDS

- A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- B. NRCA (RM) - The NRCA Roofing Manual.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of coping, illustrating shape, finish and color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in metal work with five years of documented experience.
- C. Field verify all measurements prior to fabrication.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. ATAS International, Inc: www.atas.com/#sle.
 - 2. Drexel Metals Inc: www.drexmet.com/#sle.
 - 3. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 4. Metal-Era Inc: www.metalera.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.

2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: As indicated on drawings.
5. Inside Face Height: As indicated on drawings.
6. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
7. Finish: 70 percent polyvinylidene fluoride.
8. Color: As selected by Architect from manufacturer's full range.

2.03 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2.04 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Field verify measurements prior to fabrication.

3.02 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.03 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: work of this section requiring sealants

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Installation Log: Submit filled-out log for each length or instance of sealant installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- B. Installation Plan: Include schedule of sealed joints, including the following:
 - 1. Installation Log Form: Include the following data fields, with known information filled out.

- a. Unique identification of each length or instance of sealant installed.
- b. Location on project.
- c. Substrates.
- d. Sealant used.
- e. Stated movement capability of sealant.
- f. Primer to be used, or indicate no primer is used.
- g. Size and actual backing material used.
- h. Date of installation.
- i. Name of installer.
- j. Actual joint width; provide space to indicate maximum and minimum width.
- k. Actual joint depth to face of backing material at centerline of joint.
- l. Air temperature.

1.06 FIELD 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 below 40 deg F.
 2. When 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.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
 1. For silicone sealants within 20 years.

1.08 FIELD 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 below 40 deg F.
 2. When 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.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nonsag Sealants:
 1. Adhesives Technology Corporation: www.atcepoxy.com.
 2. Bostik Inc: www.bostik-us.com.
 3. Dayton Superior Corporation: www.daytonsuperior.com
 4. Dow Corning Corporation: www.dowcorning.com/construction/sle.
 5. Hilti, Inc: www.us.hilti.com/#sle.
 6. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.

7. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
8. Pecora Corporation: www.pecora.com/?sle.
9. Sherwin-Williams Company: www.sherwin-williams.com.
10. Sika Corporation: www.usa-sika.com.
11. Specified Technologies Inc: www.stifirestop.com/#sle.
12. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
13. W.R. Meadows, Inc: www.wrmeadows.com/sle.
14. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants:

1. Adhesives Technology Corporation: www.atcepoxy.com.
2. Bostik Inc: www.bostik-us.com.
3. Dayton Superior Corporation: www.daytonsuperior.com.
4. Dow Corning Corporation: www.dowcorning.com/construction/sle.
5. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
6. Pecora Corporation: www.pecora.com/?sle.
7. Sherwin-Williams Company: www.sherwin-williams.com.
8. Sika Corporation: www.usa-sika.com.
9. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
10. W.R. Meadows, Inc: www.wrmeadows.com/sle.
11. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.03 NONSAG JOINT SEALANTS

- A. Type - General Purpose Exterior Sealant - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M, G, O and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 5. Color: To be selected by Architect from manufacturer's standard range.
 6. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/#sle.
 - c. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com/#sle.
 - d. Sika Corporation; Sikasil WS-290: www.usa.sika.com/#sle.
 - e. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.
 - f. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
 - g. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.
 - h. Tremco Commercial Sealants & Waterproofing; Spectrem 4-TS: www.tremcosealants.com/#sle.
 - i. Substitutions: See Section 01 60 00 - Product Requirements.
 7. Applications:
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Joints between concrete and other materials.

- B. Type - Moving Joint Sealant - Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.
 - 1. Products:
 - a. C.R. Laurence; CRL 777 Butyl Rubber Sealant.
 - b. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; General Purpose Butyl Sealant: www.tremcosealants.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Applications:
 - a. Lap Joints in Sheet Metal Fabrications

2.04 SELF-LEVELING JOINT SEALANTS

- A. Type - Exterior Pavement Sealant - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: Gray.
 - 4. Service Temperature Range: Minus 40 to 180 degrees F.
 - 5. Products:
 - a. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - b. Sherwin-Williams Company; Stampede 2SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - c. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.
 - d. Sika Corporation; Sikaflex-2c SL: www.usa.sika.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
 - 6. Applications:
 - a. Control and Expansion Joints in Concrete Paving

2.05 ACCESSORIES

- A. Sealant Backing Rod, Closed-Cell Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
 - 3. Products:
 - a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Sealant Backing Rod, Bi-Cellular Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
 - 3. Products:
 - a. Adfast USA Inc; Adseal BR-2600 Backer Rod: www.adfastcorp.com/#sle.
 - b. Nomaco, Inc; SOF Rod: www.nomaco.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- D. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- E. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

- F. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates and joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Install sealant as indicated in drawings and at all dissimilar materials.
- B. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- C. Provide joint sealant installations complying with ASTM C1193.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Do not seal the following types of joints.
 - 1. Intentional weepholes in masonry.
 - 2. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - 3. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - 4. Joints where installation of sealant is specified in another section.
 - 5. Joints between suspended panel ceilings/grid and walls.
 - 6. Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
- I. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- J. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

**SECTION 22 05 00
PLUMBING COMMON WORK RESULTS**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the equipment and systems indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Plumbing work shall comply with specification section 230500.
- B. In addition to Division 22, Plumbing work shall comply with the following sections:
 - 1. Section 230500 HVAC Common Work Results
 - 2. Section 230529 Pipe Hangers and Supports
 - 3. Section 230553 Mechanical Identification
 - 4. Section 230593 Cleaning and Testing
 - 5. Section 230594 Testing Adjusting and Balancing
 - 6. Section 230719 Piping Insulation

1.3 SUBMITTALS

- A. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

1.4 REGULATORY AND UTILITY REQUIREMENTS

- A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.
- B. Contractor is responsible for paying for all fees, permits, and inspections required to complete their work.
- C. Contractor shall include all work required to install new and relocate utilities and meters as shown on drawings.
- D. Contractor shall notify Owner of any utility service shutdown 48 hours in advance. This includes water, sanitary, and storm systems.

1.5 SUBSTITUTIONS

- A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.
- B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:
 - 1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.
 - 2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.
 - 3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.
- C. Approval
 - 1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.
 - 2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repared at the sole expense of the Contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

**SECTION 22 11 00
PLUMBING PIPING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Plumbing Piping Systems indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment Included in this section:
 - 1. Storm

1.2 REFERENCES

- A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. The adopted version of the Uniform Plumbing Code shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

- A. Product Data
 - 1. Catalog sheets and specifications indicating manufacturer name, pipe/fitting type, applicable reference standard, schedule, or class for specified pipe and fittings.
 - 2. Material Schedule: Itemized pipe and fitting material list for each specified piping application in Pipe and Fittings Schedule as defined in Part 3 of this specification section. Where optional materials are specified indicate option selected.
- B. Submit piping layout drawings as per specification section 230500 HVAC Common Work Results.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Comply with the most recent version following standards:
 - a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.
 - 2. Use only materials and methods allowed by applicable codes and authority having jurisdiction (AHJ). It is the contractor's responsibility to confirm if plastic piping is acceptable with the AHJ prior to installation.

B. Qualification of Brazers

1. Comply with the following: The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe for Threading: Standard weight, Schedule 40, black; ASTM A 53 or ASTM A 135.
- B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black; ASTM A 53, Grade B, Type F for sizes 3/4" to 1-1/2", and Type E or S for sizes 2" to 24", or ASTM A 135.
- C. Malleable Iron, Steam Pattern Threaded Fittings
1. 150 lb Class: ASME B16.3.
 2. 300 lb Class: ASME B16.3.
- D. Cast Iron Fittings
1. Drainage Pattern, Threaded: ASME B16.12.
 2. Steam Pattern, Threaded: ASME B16.4.
 - a. Standard Weight: Class 125.
 - b. Extra Heavy Weight: Class 250.
 3. Flanged Fittings and Threaded Flanges: ASME B16.1.
 - a. Standard Weight: Class 125.
 - b. Extra Heavy: Class 250.
- E. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.
- F. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- G. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.2 COPPER AND BRASS PIPE, TUBING AND FITTINGS

- A. Copper Tube, Types K and L: ASTM B 88.
- B. Wrought Copper Tube Fittings, Solder Joint: ASME B16.22.
- C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.
- D. Drainage Tube, Type DWV: ASTM B 306.

- E. Wrought Copper Drainage Tube Fittings, Solder Joint: ASME B16.29.
- F. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23.
- G. Chrome Plated Grade A Red Brass Threaded Pipe, Standard Weight: ASTM B 43.
 - 1. Plating: 0.02 mil chromium over 0.2 mil nickel plating, high polish finish. Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solder joint.
- I. Flared Tube Fittings
 - 1. Water Tube Type: ASME B16.26.
- J. Flanges: Conform to the Standards for fittings used in systems.
 - 1. Brazing Flanges: ASME B16.24, hubs modified for brazing ends.
- K. Mechanical Press Fittings
 - 1. Copper with EPDM seals; ASME B16.51, NSF-61.

2.3 CAST IRON PIPE AND FITTINGS

- A. Bell and Spigot Soil Pipe: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF. All pipes shall be marked with CISPI and NSF listing.
- B. Bell and Spigot Soil Pipe Fittings: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF.
- C. Bell and Spigot Soil Pipe Gaskets: ASTM C564
- D. Hubless Pipe: Bitumin coated; CISPI Standard No. 301. All pipes shall be marked with CISPI and NSF listing.
- E. Hubless Pipe Fittings: Drainage Pattern, Bitumin coated; CISPI No. 301.
- F. Hubless Joint Couplings: Stainless steel shield and clamp assembly, and elastomer sealing sleeve; CISPI-310.

2.4 DUCTILE IRON PIPE AND FITTINGS

- A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.
 - 1. 3"- 4": Class 51.
 - 2. 6" and Over: Class 50.
- B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

2.5 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

- A. Couplings: Gruvlok Fig. 7401 or 74, or Victaulic Co.'s Style 07 or 107, having minimum pressure rating of:

1. 750 psi from 1-1/2" to 4"
 2. 700 psi for 6"
 3. 600 psi for 8"
- B. Couplings: Gruvlok Fig. 7001, or Victaulic Co.'s Style 77, having pressure rating of:
1. 1000 psi for 3/4" to 6"
 2. 800 psi for 8" to 12"
 3. 300 psi for 14" to 24"
- C. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:
1. Steel: ASTM A 53 or A 106, Grade B.
 2. Malleable Iron: ASTM A 47.
 3. Ductile Iron: ASTM A 536.

2.6 JOINING AND SEALANT MATERIALS

- A. Thread Sealant
1. LA-CO Industries', Slic-Tite Paste with Teflon.
 2. Loctite Corp.'s No. 565 Thread Sealant.
 3. Thread sealants for potable water shall be NSF approved.
- B. Solder: Solid wire type conforming to the following:
1. Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB)
- C. Brazing Alloys
1. Type 1: AWS A5.8, Class BCuP-5, for brazing copper to brass, bronze, or copper.
 2. Type 2: AWS A5.8, Class BAg-7, for brazing copper to steel or stainless steel.
- D. Brazing Flux: FS O-F-499, Type B.
- E. Gaskets For Use With Ductile Iron Water Pipe and Cast Iron Drainage Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.
- F. Flange Gasket Material
1. For Use With Cold Water: 1/16" thick rubber.

2. For Use With Hot Water, Air or Steam: Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.
- G. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.
- H. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.

2.7 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

- A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc.
- B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.8 DIELECTRIC CONNECTORS

- A. Use for all connections between piping connections of dissimilar materials.
- B. Unions
1. Rated 250 psig at 180° F; ASME B16.39; Wilkins Model DU.
 2. Rated 100 psig at 210° F; ASME B16.39; Wilkins Model DU with high temperature gasket.
 3. Rated Above 100 psig and 210° F: Use Flange Electrical Insulation Kit specified below.
- C. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.
1. Rated 150 psi at 250° F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and Mylar sleeves; Model 150 by APS, Lafayette, LA.

2.9 PIPE SLEEVES

- A. Install pipe sleeves as noted on the drawings or indicated in this specification section. The following piping material shall be used as noted in the installation section in this specification:
1. Type A: Schedule 40 steel pipe.
 2. Type B: No. 16 gauge galvanized sheet steel.
 3. Type C: Schedule 40 steel pipe with 1/4" steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.
 4. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.

2.10 PIPING ESCUTCHEONS

- A. Cast Brass: Polished chrome plated finish, with set screw.
- B. Cast Iron: Solid type, unplated, with set screw; Model 395 by Grinnell Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping shall be stored to prevent debris from entering the piping. This shall consist of piping caps or temporary covers.
- B. Above or below grade piping that is roughed in shall have a temporary cap installed to prevent debris from entering the piping system. The cap shall be removed to allow for the final connection or continuation of piping to be installed.
- C. Install piping at approximate locations indicated, and at maximum height.
- D. Install piping clear of door swings, and above sash heads.
- E. Make allowances for expansion and contraction.
- F. Allow for a minimum of 1" free air space around pipe or pipe covering, unless otherwise specified.
- G. Install horizontal piping with a constant pitch, and without sags or humps.
 - 1. Storm Piping: Pitch piping 1/8 1/4" per foot downward, in direction of flow, unless otherwise noted.
- H. Install vertical piping plumb.
- I. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube, and mechanically extracted joints in Type L copper tubing.
- J. Cut pipe and tubing ends square; ream before joining.
- K. Threading: Use American Standard Taper Pipe Thread Dies.
 - 1. Thread brass pipe with special brass threading dies.

3.2 DRAINAGE SYSTEMS

- A. Fittings
 - 1. Long Sweep Fittings
 - a. Long sweep fittings shall be those in the category where 4" diameter piping has a minimum R/D = 10.5" / 4".
 - b. Use long sweep drainage pattern fittings for all fittings unless noted otherwise.
 - c. Use of other fittings must be approved by Engineer in writing prior to use.

2. Short Sweep Fittings
 - a. Short sweep fittings shall be those in the category where 4" diameter piping has a minimum R/D = 7.5"/4".
 - b. Short sweep drainage pattern fittings may be used for the following.
 - 1) Vent piping.
 - 2) Fixture connections.
 - 3) Other locations as approved by the Engineer in writing.
3. Vertical Offsets: Make vertical offsets with 45° elbows, or 1/8 bends.

3.3 PIPE JOINT MAKE-UP

- A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.
 1. Chrome Plated Brass Pipe: Tighten joint with a strap or Parmalee wrench; do not mar pipe finish. Install piping so that no threads are visible.
- B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type of solder specified. Remove residue.
- C. Flanged Pipe Joint
 1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
 2. Provide a gasket for each joint.
 - a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.
 3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.
- D. Caulked Joint: Pack hub with joint packing specified, and caulk. Run 12 ounces molten lead for each inch of pipe diameter. Caulk cooled lead ring and face off smoothly.
- E. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.
- F. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
 1. Cut grooved end piping is not acceptable.
- G. Hubless CI Pipe Joint: Make up joint with hubless fitting and couplings, in conformance with the manufacturer's printed installation instructions.
- H. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.
- I. Mechanical Press Joint: Install joint with tool approved by joint manufacturer. Installer shall be fully trained and have experience in installing this type of joint.

J. Dissimilar Pipe Joint

1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and caulk into the cast iron bell.
2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.

3.4 PIPING PENETRATIONS

- A. Install pre-manufactured flexible boots for vent terminations through roof. Use materials compatible with roof system.
- B. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

CONSTRUCTION	SLEEVE TYPE
1. Frame construction.	None Required
2. Foundation walls.	A*
3. Non-waterproof interior walls.	B*
4. Non-waterproof interior floors on metal decks.	D*
5. Non-waterproof interior floors not on metal decks.	B*
6. Floors not on grade having a floor drain.	A
7. Floors over mechanical equipment, steam service, machine, and boiler rooms.	A
8. Floors finished or to be finished with latex composition or terrazzo, and on metal decks.	D*
9. Floors finished or to be finished with latex composition or terrazzo, and not on metal decks.	A
10. Earth supported concrete floors.	None Required
11. Exterior concrete slabs on grade.	A
12. Fixtures with floor outlet waste piping.	None Required
13. Metal roof decks.	C
14. Non-metal roof decks.	A
15. Waterproof floors on metal decks.	D
16. Waterproof floors not on metal decks.	A
17. Waterproof walls.	A

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

C. Diameter of Sleeves and Core Drilled Holes

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.
2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
 - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of pipe, unless otherwise specified.
 - b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of insulation, unless otherwise specified.
 - c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

D. Length of Sleeves (except as shown otherwise on Drawings)

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2" above the finished floor level, except as follows:
 - a. In furred spaces at exterior walls, extend sleeve 1" above the finished floor level.
3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2" above the concrete slab.
4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

E. Packing of Sleeves and Core Drilled Holes

1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 07 84 00 - FIRESTOPPING.
2. Pack sleeves in exterior walls below grade and concrete floor slabs at or below with mechanical modular seals.

3.5 ESCUTCHEONS

- A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
1. In Finished Spaces: chrome plated cast brass.
 2. Unfinished Spaces (Including Exterior Concrete Slabs): unplated cast iron.
 3. Fasten plates with set screws.
 4. Plates are not required in pipe shafts or furred spaces.

3.6 PIPE AND FITTING SCHEDULE

- A. Refer to Drawings for Piping Application Schedule.
- B. Where options are given, choose only one (1) option for each piping service. No deviations from the selected option will be allowed.

END OF SECTION

**SECTION 22 40 00
PLUMBING FIXTURES AND EQUIPMENT INSTALLATION**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Plumbing Fixtures and Equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Refer to the Plumbing Material Lists and Equipment Schedules for additional capacity and equipment requirements.

1.3 SUBMITTALS

- A. Fixture and Equipment Data: Catalog sheets, specifications, rough-in dimensions, and installation instructions for each item specified except fasteners.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Comply with the most recent version following standards:
 - a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.
 - b. Applicable sections of ANSI/ASME A112 – Standards for Plumbing Equipment
 - 2. Materials and installations designated as handicapped accessible shall conform with the following:
 - a. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
 - b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
 - 3. Each fixture carrier support shall be listed by model number in the fixture support manufacturer's Fixture Support Selection Guide as being recommended for support of the appropriate fixture.
- B. Plainly and permanently mark each fixture and fitting with the manufacturer's name or trade mark.
- C. Acid resistant surfaces shall be plainly and permanently marked with the manufacturer's label or symbol indicating acid resistance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The following manufacturers are considered equal to the basis of design listed in the material list and schedules. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

Equipment	Acceptable Manufacturers
Drainage Fixtures	Josam, Mifab, Smith, Sun, Wade, Watts, Zurn

- B. All items shall be commercial grade unless specified otherwise.
- C. All items shall be supplied by the same manufacturer.

2.2 DRAIN VALVES

- A. Provide on all equipment with drain connections and as shown on details.
- B. Cast brass body with renewable units, hose bibb vacuum breaker (ASSE 1011) with drainage feature, and removable cast iron handwheel with vandal resistant fastener.
1. Valve must be completely assembled to make hose connection.
 2. Connections: 1/2 or 3/4 inch threaded or solder end inlet, and 3/4 inch hose bibb outlet.

PART 3 - EXECUTION

3.1 FIXTURE INSTALLATION

- A. Roof Drains
1. Coordinate drain installation with deck and roofing Work.
 2. Unless otherwise indicated by dimensions on the Drawings, locate drains as follows:
 - a. Place drains minimum three (3) feet away from items on roof (parapets, walls, gravelstops, pipes, vents, scuttles, equipment and curbs, etc.) to allow for flashing.
 - b. Install drains at low points of roof deck and where normal deck deflection will be at its maximum.
 3. Drains in Cast Concrete: Set and securely brace drain body so that sump flange is level with, or slightly below surface of concrete.
 4. Drains in Steel Decks: Install drains as shown on the Construction Work Drawings.

- a. Do not core drill or cut openings. Coordinate roof deck openings with Construction Work Contractor.
 - b. Set sump receiver surface level with deck surface.
 - c. Secure drain body with underdeck clamp.
 5. Drains in Pre-cast and Pre-stressed Concrete Deck Units: Install drains as shown on the Construction Work Drawings.
 - a. Do not core drill or cut openings.
 - b. Coordinate roof deck openings with Construction Work Contractor. Set sump receiver surface level with deck surface.
 - c. Secure drain body with underdeck clamp.
 6. Fasteners
 - a. Coat bolt threads with anti-seize lubricant before final installation.
- B. Drains and Inlets During Construction
1. Provide a temporary cover for all floor, roof, trench and area drains during construction to prevent debris getting into the system and protect drain grates. Remove temporary covers and clean grates at the end of construction.
 2. The contractor is responsible for the flushing of all drains used during construction. This includes main and branch lines. If solids or debris in the system result in flow issues, the contractor will be required to camera and remove obstructions.

END OF SECTION

**SECTION 23 05 00
HVAC COMMON WORK RESULTS**

PART 1 - GENERAL

1.1 SCOPE

- A. The work under this section includes basic mechanical requirements, which are applicable to all Division 21, 22 and 23 sections.
- B. Overview of work
 - 1. Demolition / Relocation / Modification
 - 2. HVAC
 - 3. Plumbing
- C. In these documents, "Contractor" refers to the mechanical contractor and all their subcontractors, unless listed otherwise. The division of work within the mechanical scope is the responsibility of the lead mechanical contractor.
- D. Contractor is responsible for providing fully functional systems.
- E. If work is shown on the drawings or listed in the specifications, it shall be included by the Contractor.
- F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.
- G. The drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every item in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.
- H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.
- I. All sizes as given are minimum except as noted.
- J. Materials shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Architect's, Engineer's, and Owner's observations from the commencement until the acceptance of the completed work.

1.2 REFERENCES

- A. Applicable provisions of Division 0 and Division 1 govern work under this Section.
- B. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.
- C. Codes
 - 1. International Building Code
 - 2. International Mechanical Code
 - 3. Uniform Plumbing Code
 - 4. International Fuel Gas Code
 - 5. International Fire Protection Code
 - 6. International Energy Conservation Code
 - 7. NFPA – National Fire Protection Association
 - 8. State or City Codes for the Boone, Iowa.
- D. Standards
 - 1. FGI Guidelines for Design and Construction of Health Care Facilities
 - 2. ASHRAE Standard 15
 - 3. ASHRAE Standard 62
 - 4. ASHRAE Standard 90.1
 - 5. SMACNA – Sheet Metal and Air Conditioning Contractors National Association, Inc.
 - 6. AMCA – Air Movement and Control Association
 - 7. ASME – American Society of Mechanical Engineers
 - 8. ANSI – American National Standards Institute
 - 9. ARI – Air Conditioning and Refrigeration Institute
- E. Governing Bodies
 - 1. Owner's Insurance Company
 - 2. State Fire Marshal
 - 3. AHJ – Authority Having Jurisdiction
 - 4. UL - Underwriters Laboratories

1.3 SUBMITTALS

- A. The review of shop drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.
- B. Refer to individual technical specification sections for specific submittal requirements.
- C. Submission of shop drawings electronically in .PDF format is preferred.
- D. If hard copies of shop drawings are utilized on this project, coordinate the quantity with the Architect and General Contractor. Provide one (1) copy for the Engineer's records.
- E. The Engineer will review one resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.
- F. Contractor may request electronic AutoCAD files from the Engineer if needed to complete their shop drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.
- G. All submittals for equipment and materials shall be reviewed and approved by the engineer prior to the fabrication or release by the contractor. This includes fabrication drawings for ductwork and fire protection and the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.
- H. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.
- I. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified.

1.4 QUALITY ASSURANCE

- A. Warranty
 - 1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.
 - 2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion.

B. Equipment Capacity

1. All equipment submitted shall meet or exceed the capacity listed in the specifications and schedules. This includes airflows / static pressure, heating / cooling capacities, pump flow / head, and all values listed in the construction documents.
2. All submitted motor brake horsepower's submitted shall be at least 5% less than the rated nominal motor horsepower. No motors shall be selected in the motor service factor with the exception of fire pumps.
3. The mechanical contractor shall be responsible for any structural, electrical, piping, ductwork or other utility modifications resulting from an alternate manufacturer than the basis of design being used.

C. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the mechanical systems. Not all fittings, risers, size changes, offsets, valves, accessories, etc. are shown on plan. If items are required to make a system fully operational but not shown on plan or in these specifications, they shall be included by the contractor.

D. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

E. It is the contractor's responsibility to determine all utility routing prior to purchase and installation of material.

F. For remodel or addition projects, the contractor shall visit and survey the site prior to submitting a bid. The contractor shall visit the site to understand the complexity of utility routing, phasing, staging, and all general installation. Submitting a bid means the contractor acknowledges the complexities of the project and has made provisions for overcoming these complexities in their bid.

G. The contractor shall report any discrepancies between these documents and site conditions immediately to the Engineer prior to submitting a bid or starting work. Submittal of a bid indicates that the contractor and the contractor's subcontractors have carefully and thoroughly reviewed the drawings, specifications, and other construction documents and have found them complete and free from ambiguities and sufficient for the purposes intended.

H. Install all equipment per the manufacturer's requirements / recommendations.

I. No equipment provided or installed shall contain mercury.
1)

J. All equipment shall be UL listed where applicable.

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF
 - a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.
2. AutoCAD
 - a. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
 - b. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required. No fee is associated with these drawings.
3. REVIT
 - a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
 - b. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
 - c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required.
 - d. Submittal of the document release form will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

- A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.
- B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:
 1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.
 2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.
 3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.
2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repared at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Engineer and the Owner. Any outage must be scheduled when the interruption causes the least interference with normal work schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours unless specifically noted in the Specifications or in the bidding requirements.
- B. This Contractor shall restore any mechanical services interrupted as a result of a lack of coordination to proper operation as soon as possible.
- C. Contractor shall notify Owner of any utility service shutdown forty-eight (48) hours in advance. This includes gas, water, sanitary, storm, fire protection, cooling, and heating systems.

1.8 REGULATORY AND UTILITY REQUIREMENTS

- A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.
- B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.
- C. Contractor shall include all work required to relocate utilities and meters as shown on drawings.
- D. Utility work 5'-0" from outside of building is by others.

1.9 PROTECTION OF FINISHED SURFACES

- A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.10 SEALING AND FIRESTOPPING

- A. Sealing and firestopping of sleeves/openings between ducts and piping and the structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.11 WORK BY OWNER AND/OR OWNER AGENCY

- A. Asbestos abatement, removal and disposal, if required, will be by the Owner under separate contract.

1.12 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. All equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
- B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation or damage from the elements.
- C. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
- D. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner's satisfaction.

1.14 DIVISION OF WORK AND COORDINATION

- A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment provided by others shall be the responsibility of the contractor responsible for providing and installing the equipment.
- B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.
- C. Utilities routed within the building shall be installed in an orderly manner. All work will be coordinated with other disciplines prior to installation. The following list ranks the priority of the utilities to be installed:
 - 1. Light fixtures
 - 2. Gravity piping
 - 3. Electrical busduct
 - 4. Ductwork
 - 5. Cable tray

6. All other piping
 7. Electrical conduits
- D. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- E. Coordinate work with the Testing and Balancing (TAB) Contractor. Verify system completion to the TAB Contractor such as pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, controls adjusted and calibrated, adjusting and balancing work. Install shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Assist the TAB Contractor as needed to complete their work.
- F. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- G. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- H. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.15 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.
- B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:
1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 2. A control sequence describing start-up, operation, and shutdown.
 3. Description of the function of each principal item of equipment.
 4. Installation instructions.
 5. Safety precautions for operation and maintenance.
 6. Diagrams and illustrations.
 7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
 8. Performance data.
 9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.

10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.16 RECORD DRAWINGS

- A. The Contractor shall maintain at least one copy each of the Specifications and Drawings on the job site at all times.
- B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.
- C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
- D. At completion of the project, the Contractor shall submit the marked-up record drawings to the General Contractor prior to final payment.

1.17 SPECIAL REQUIREMENTS

- A. Contractor bid shall allow color selection by Architect of any piece of exposed equipment from all available colors. Base bid color selection shall include those considered 'premium' by the manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.

2.2 SEALING AND FIRESTOPPING

- A. Non-Rated Penetrations
 1. Piping Penetrations Through Below Grade Walls
 - a. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the piping and the cored opening or a water-stop type wall sleeve.
 2. Piping and Ductwork Penetrations
 - a. At penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe/duct and sleeve or opening.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Coordinate work with the Owner to minimize disruption to the existing building occupants.
- C. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed. Perform demolition that may not be shown but required to accomplish new work. Where ductwork or piping is removed and not reconnected with new work, cap ends of existing services as if they were new work.
- D. Remove portion of piping indicated to be removed and cap or plug remaining utility with same or compatible materials.
- E. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. All designated equipment is to be turned over to the Owner for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.
- F. Unless noted otherwise, all duct and piping branches shown to be removed shall be removed back to the main and capped. Pressure piping shall have shutoff valves and caps installed.
- G. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Provide clearance for inspection, repair, replacement, and service to all equipment to include a minimum of 36 inches from all obstructions (walls, structure, ductwork, pipes, etc.). Clearance shall maintain access to all electrical panels, access doors, controllers, valves, junction boxes and operators and include the area directly in front of and above the system components.

3.3 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated mechanical systems installation in accordance with Section 312316.13 - Trenching.

3.4 SEALING AND FIRESTOPPING

- A. Non-Rated Surfaces
 - 1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.
 - 2. Install escutcheons or floor/ceiling plates where pipe/duct penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.

3.5 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.6 SITE OBSERVATIONS

- A. Site observations shall be performed by the Engineer at the following project milestones:
 - 1. Prior to enclosure of the following areas:
 - a. Helipad snowmelt layout
 - 2. Final project completion
- B. Contractor shall provide seven (7) working days' notice to Engineer prior to site visit.
- C. The Engineer is only responsible to conduct one (1) final site visit. If upon visiting the site, the Engineer finds that not enough work is complete for the final site visit, the Contractor shall be responsible to bear the cost for the Engineer to travel to the site and revisit. Revisiting will not occur until payment is agreed upon.

3.7 EQUIPMENT STARTUP

- A. Contractor shall provide startup of equipment by factory certified personnel for equipment listed above.
- B. For all other equipment, Contractor shall perform startup per manufacturer's requirements. Startup shall be performed by personnel qualified for this work.
- C. Contractor shall test equipment to be fully functional. Test all equipment safeties and emergency stops. Test all control set-points and equipment modes.

- D. Contractor shall return to site as needed to adjust equipment for seasonal equipment performance changes.

3.8 OWNER TRAINING

- A. Contractor shall include at least four (4) hours for in their bid to provide complete Owner training for all the mechanical systems. Training shall include explanation of system operation, startup/shutdown, routine maintenance, seasonal changes, and controls adjustments. Coordinate acceptable training schedule with Owner.
- B. All training provided for the Owner shall comply with the format, general content requirements and submission guidelines specified under Section 019101, or 019102.
- C. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 2 hours or for the duration noted in the technical Specifications.

3.9 PROJECT CLOSEOUT REQUIREMENTS

- A. Final project closeout tasks
 - 1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.
 - 2. All equipment labeled per specifications.
 - 3. All equipment cleaned and ready for use. Install new filters in all equipment with filters; do not use Owner's spare filter sets.
- B. Contractor requirements
 - 1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.
 - 2. Operation and Maintenance (O & M) Manuals shall include the following:
 - a. Contractor contact for warranty work
 - b. Approved shop drawings, incorporating all review comments
 - c. Warranty copies
 - d. Equipment start-up reports
 - e. Testing and balancing reports
 - f. Operation and maintenance instructions
 - 3. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)



Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- AutoCAD DWG Files (Version _____) Adobe PDF Files
 REVIT Files (Version _____) Other

Requesting Party:

Name: _____ Address 1: _____
 Company: _____ Address 2: _____
 Signature: _____ Email Address: _____
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Supporting Data Attached:

- Drawings Product Data Samples Tests Reports Other _____

**SECTION 23 05 23
HYDRONIC VALVES**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Hydronic Valves indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Abbreviations
 - 1. IBBM: Iron body, bronze mounted.
 - 2. OS&Y: Outside screw and yoke.
 - 3. WOG: Water, oil, gas.
 - 4. WSP: Working steam pressure.

1.3 SUBMITTALS

- A. Product Data: Catalog sheets, specifications and installation instructions for each valve type.
- B. Operation and Maintenance Data: For valves, safety valves, pressure-reducing valves, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

- A. Acceptable Manufacturers (unless specified otherwise)
 - 1. Apollo
 - 2. Conbraco
 - 3. Crane
 - 4. Hammond
 - 5. HCl
 - 6. Jenkins
 - 7. Milwaukee

8. Nibco
 9. Stockham
 10. Victaulic
 11. Watts
- B. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one (1) manufacturer.
- C. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.
- D. Valve parts of same manufacturer, size and type shall be interchangeable.
- E. Manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified.
- F. Manually operated valves shall open in a counterclockwise direction by means of round ventilated type handwheels.
1. Exception: Cross handle type handwheels are acceptable for valves up to three (3) inches in size.
- G. In open position, wedge and stem of gate valves shall clear the waterway completely.
- H. Valves which use packing shall be capable of being packed when wide open and under full working pressure.
- I. Size valves the same size as the piping in which they are installed, unless otherwise specified.
- J. Provide extended shafts for all valves installed on insulated piping.
- K. Coordinate the end connection type with the piping and other specialties in the systems. The following are acceptable styles:
1. Solder
 2. Mechanical press
 3. Threaded
 4. Flanged
 5. Grooved
- L. Provide unions in the system as needed for installation or removal of valves and specialties.

2.2 MATERIALS

- A. Body

1. Cast Iron: ASTM A 126 66, Class B, higher strength cast iron.
2. Bronze: For use up to 150 psig WSP, ASTM B 62 and over 150 psig to 300 psig WSP, ASTM B 61.
3. Cast Steel: ASTM A 216 Grade WCB.
4. Forged Steel: ASTM A 105 Grade 2.

B. Stem

1. Cast Manganese Bronze: ASTM B 584.
2. Cast Silicon Brass: ASTM B 584.
3. Rolled Silicon Brass: ASTM B 98 Alloy D.
4. Rolled Aluminum Bronze: ASTM B 150 Alloy 1.
5. Rolled Manganese Bronze: ASTM B 138 Alloy A (half hard).
6. Naval Brass: ASTM B 21 Alloy A or Alloy C (hard).
7. Carbon Steel: As specified for particular type of valve.
8. Stainless Steel: As specified for particular type of valve.

C. Trim: As specified for particular type of valve.

2.3 CHECK VALVES

- A. CK-1: 125 psig WSP, 200 psig WOG, bronze body, brass or bronze trim, horizontal swing, renewable and regrindable disc, and threaded ends. Face discs for cold water service with Teflon.
- B. CK-2: 125 psig WSP, 200 psig WOG, bronze body, brass or bronze trim, horizontal swing, renewable and regrindable disc, and solder ends. Face discs for cold water service with Teflon.
- C. CK-3: 125 psig WSP, 200 psig WOG, IBBM, horizontal swing, bolted bonnet, regrindable and renewable seat ring and disc, and threaded or flanged ends depending on size. Discs on valves four (4) inch size and larger may be cast iron with bronze face.

2.4 BALL VALVES

- A. BV-1: 150 psig WSP, 600 psig WOG, two (2) piece bronze body, full-port, solid blow-out proof stainless steel stem, Teflon seats and seals, stainless steel ball, corrosion resistant steel lever handles with vinyl grips, balancing stop, and threaded or solder ends.

2.5 GROOVED END VALVES

- A. Valves shall be of type, material and pressure rating, as required by the particular application, meeting the requirements listed above.

2.6 BALANCING VALVES

- A. Acceptable Manufacturers

1. Bell & Gossett
2. Flow Design
3. Griswold
4. Hays
5. HCl
6. Nexus
7. Pro-Hydronic Specialties
8. Victaulic

- B. Refer to valve schedule for additional requirements.

- C. Automatic Flow-Control Valves

1. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT insert and check valve.
2. Valve bodies to have 1/4 inch threaded drain/purge port. Valves to have memory stop and calibrated nameplate
3. Body: Brass or ferrous metal.
4. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
5. Combination Assemblies: Include bronze or brass-alloy ball valve with glass and carbon filled TFE seat rings.
6. Identification Tag: Marked with zone identification, valve number, and flow rate.
7. Size: Same as pipe in which installed.
8. Performance: Maintain constant flow, plus or minus five (5) percent over system pressure fluctuations.
9. Minimum CWP Rating: 175 psig
10. Maximum Operating Temperature: 200° F

D. Combination Manual Balancing and Shut-Off Valves

1. Heavy duty brass construction of angle or straightway pattern with 200 psig working water pressure at 250° F, one (1) union connection and one (1) threaded or solder end, visible graduated dial indicator, memory stop, and wheel handle with full turn opening.

2.7 SAFETY AND RELIEF VALVES

A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Power Boilers, Unfired Pressure Vessels, etc., shall be tested, rated and listed by National Board of Boiler and Pressure Vessel Inspections and shall bear symbol of ASME and NBB and PVI, unless otherwise specified. Liquid relief valves do not require ASME tagging or marking, or NBB and PVI Certification. Valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:

1. Valves for Unfired Pressure Vessels: Safety and safety relief valves on secondary side of unfired pressure tanks, water heaters and heat exchangers shall comply with Code requirements governing applicable equipment as outlined in ASME Code, Section IV, Article 4, Paragraph HG 400.3 and as follows: Secondary side of heat exchanger shall be protected by officially rated valves, set for same pressure or temperature as heretofore specified, when secondary side furnishes steam or hot water for purpose equivalent to purposes for which a boiler would be installed; valves for this purpose shall be sized in accordance with Unfired Vessel Code.
2. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over three (3) inches IPS must be furnished with 125 lb. or 250 lb. flanged inlet and may be equipped with female threaded or 125 lb. flanged outlet.
3. Acceptable Manufacturers: Consolidated Series 1900 or 1900/P; Kunkle F16.6030, 6252 300 or 600; Keckley – Type 40 or 301.

2.8 GAUGE COCKS

A. Acceptable Manufacturers:

1. Marsh Instrument Company
2. Mueller Instruments Co.
3. H.O. Trerice Co.
4. Weksler Instruments Corp.

B. Gauge Cocks: All brass construction, "T" or lever handles, screwed ends, built for 300 psig hydraulic pressure.

2.9 VACUUM RELIEF VALVES

A. For Use With Water: Watts Regulator Co. No. N36.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install valves at locations noted on the drawings or specified.

3.2 DISCHARGE PIPING FROM LIQUID RELIEF VALVES

- A. Connect vent piping to the discharge outlet of all relief valves and terminate over floor drain, bell outlet or other approved point of waste.

3.3 VALVE APPLICATION SCHEDULE

- A. Schedule of valve applications for the different services is as follows:

SERVICE	SYMBOL	PRESSURE CLASS	SIZE	VALVE	NOTES
Heating Water Glycol Heating Water	HWS/HWR GHWS/GHWR	125 psi and Less	3" and Less	BV-1 CK-1,2	1
			2" and Less	GT-1	

Notes: 1. Not for connections to boiler.

END OF SECTION

**SECTION 23 05 24
STEAM AND STEAM CONDENSATE VALVES**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Steam and Steam Condensate Valves indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment included in This Section
 - 1. Steam
 - 2. Condensate

1.2 REFERENCES

- A. Abbreviations
 - 1. IBBM: Iron body, bronze mounted.
 - 2. OS&Y: Outside screw and yoke.
 - 3. WOG: Water, oil, gas.
 - 4. WSP: Working steam pressure.

1.3 SUBMITTALS

- A. Product Data: Catalog sheets, specifications and installation instructions for each valve type.
- B. Operation and Maintenance Data: For valves, safety valves, pressure-reducing valves, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

- A. Acceptable Manufacturers (unless specified otherwise):
 - 1. Apco
 - 2. Conbraco
 - 3. Crane

4. Hammond
 5. Jenkins
 6. Milwaukee
 7. Nibco
 8. Stockham.
- B. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one manufacturer.
- C. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.
- D. Valve parts of same manufacturer, size and type shall be interchangeable.
- E. Manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified.
- F. Manually operated valves shall open in a counterclockwise direction by means of round ventilated type handwheels.
1. Exception: Cross handle type handwheels are acceptable for valves up to 3 inches in size.
- G. In open position, wedge and stem of gate valves shall clear the waterway completely.
- H. Valves which use packing shall be capable of being packed when wide open and under full working pressure.
- I. Size valves the same size as the piping in which they are installed, unless otherwise specified.
- J. Provide extended shafts for all valves installed on insulated piping.
- K. Valves used for shut-off and boiler shell are to have adjustable packing.

2.2 MATERIALS

- A. Body
1. Cast Iron: ASTM A 126 66, Class B, higher strength cast iron.
 2. Bronze: For use up to 150 psig WSP, ASTM B 62 and over 150 psig to 300 psig WSP, ASTM B 61.
 3. Cast Steel: ASTM A 216 Grade WCB.
 4. Forged Steel: ASTM A 105 Grade 2.

- B. Stem
 - 1. Cast Manganese Bronze: ASTM B 584.
 - 2. Cast Silicon Brass: ASTM B 584.
 - 3. Rolled Silicon Brass: ASTM B 98 Alloy D.
 - 4. Rolled Aluminum Bronze: ASTM B 150 Alloy 1.
 - 5. Rolled Manganese Bronze: ASTM B 138 Alloy A (half hard).
 - 6. Naval Brass: ASTM B 21 Alloy A or Alloy C (hard).
 - 7. Carbon Steel: As specified for particular type of valve.
 - 8. Stainless Steel: As specified for particular type of valve.
- C. Trim: As specified for particular type of valve.

2.3 GATE VALVES

- A. GT-1: 125 psig WSP, 200 psig WOG, bronze body, union bonnet, solid wedge disc, and threaded ends.
- B. GT-2: 125 psig WSP, 200 psig WOG up to 12 inch size, and 150 psig WOG for 14 inch and 16 inch sizes; IBBM OS&Y, bolted bonnet, solid wedge disc, and threaded or flanged ends depending on size.

2.4 ANGLE AND GLOBE VALVES

- A. GL-1: 125 WSP, 200 psig WOG, bronze body, threaded bonnet, and threaded ends.
- B. GL-2: 125 psig WSP, 200 psig WOG, IBBM OS&Y, bolted bonnet, and threaded or flanged ends depending on size. GL-3: 250 psig WSP, 500 psig WOG, IBBM OS&Y, bolted bonnet, renewable seat and disc, and threaded or flanged ends depending on size.

2.5 CHECK VALVES

- A. CK-1: 125 psig WSP, 200 psig WOG, bronze body, brass or bronze trim, horizontal swing, renewable and regrindable disc, and threaded ends. Face discs for cold water service with teflon.
- B. CK-2: 125 psig WSP, 200 psig WOG, IBBM, horizontal swing, bolted bonnet, regrindable and renewable seat ring and disc, and threaded or flanged ends depending on size. Discs on valves 4 inch size and larger may be cast iron with bronze face.

2.6 SAFETY AND RELIEF VALVES

- A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Power Boilers, Unfired Pressure Vessels, etc., shall be tested, rated and listed by National Board of Boiler and

Pressure Vessel Inspections and shall bear symbol of ASME and NBB and PVI, unless otherwise specified. Liquid relief valves do not require ASME tagging or marking, or NBB and PVI Certification. Valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:

1. Valves for Unfired Pressure Vessels: Safety and safety relief valves on secondary side of unfired pressure tanks, water heaters and heat exchangers shall comply with Code requirements governing applicable equipment as outlined in ASME Code, Section IV, Article 4, Paragraph HG 400.3 and as follows: Secondary side of heat exchanger shall be protected by officially rated valves, set for same pressure or temperature as heretofore specified, when secondary side furnishes steam or hot water for purpose equivalent to purposes for which a boiler would be installed; valves for this purpose shall be sized in accordance with Unfired Vessel Code.
2. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3 inches IPS must be furnished with 125 lb. or 250 lb. flanged inlet and may be equipped with female threaded or 125 lb. flanged outlet.

2.7 GAUGE COCKS

- A. Acceptable Manufacturers:
 1. Marsh Instrument Company
 2. Mueller Instruments Co.
 3. H.O. Trerice Co.
 4. Weksler Instruments Corp.
- B. Gauge Cocks: All brass construction, "T" or lever handles, screwed ends, built for 300 psig hydraulic pressure.

2.8 VACUUM RELIEF VALVES

- A. For Use With Steam
 1. Up to 15 psig: ITT Hoffman No. 62, and Watts Regulator Co. No. N36.
 2. 16 psig to 150 psig: ITT Hoffman No. 62.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install valves at locations noted on the drawings or specified.

- B. Provide chain wheel operators and chains on all gate, globe, and butterfly valves installed ten (10) feet or more above finished floor. Chains shall extend down to seven (7) feet above finished floor.

3.2 DISCHARGE PIPING FROM LIQUID RELIEF VALVES

- A. Connect vent piping to the discharge outlet of all relief valves and terminate over floor drain, bell outlet or other approved point of waste.

3.3 VALVE APPLICATION SCHEDULE

- A. Schedule of valve applications for the different services is as follows:

SERVICE	SYMBOL	PRESSURE CLASS	SIZE	VALVE	NOTES
Condensate Return, Steam	LPR/MPR LPS/MPS	125 psi and Less	2" and Less	GT-1 GL-1 CK-1	1
			2-1/2" and Up	GT-2 GL-2 CK-2	1

Notes:

1. See specifications for blow-off valves earlier in this section.
2. Not for connections to boiler.

END OF SECTION

**SECTION 23 05 29
PIPE HANGERS AND SUPPORTS**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Pipe Hangers and Supports indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Refer to Section 230719, PIPING INSULATION for work related to this section.

1.3 SUBMITTALS

- A. Product Data
 - 1. Manufacturer's catalog sheets and specifications for hangers and supports materials.
 - 2. Installation instructions.
 - 3. Schedule indicating what type of hangers or support will be used for various piping types.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with the applicable requirements of the ASME B31 Piping Codes.
 - 2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.
 - 3. Materials for use in Sprinkler Systems and Standpipe and Hose Systems shall comply with the requirements of NFPA 13 and NFPA 14 as applicable.
 - 4. Hang and support cast iron soil pipe and fittings in accordance with the recommendations of the Cast Iron Soil Pipe's Institute's (CISPI) Cast Iron Soil Pipe and Fittings Handbook.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
Up to 2-1/2	4	16	6	10

- B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE
Up to 2-1/2	8	18

- C. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut.
 1. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping ten (10) inches in size and larger.
 2. Swivel ring type hangers will be allowed for sprinkler piping up to a maximum of two (2) inches in size.
- D. Adjustable Floor Rests and Base Flanges: Steel.
- E. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two (2) nuts at each end for positioning rod and hanger, and locking each in place.
- F. Riser Clamps: Malleable iron or steel.
- G. Rollers: Cast Iron.

2.2 ANCHORS AND ATTACHMENTS

- A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.
- B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS Series.
- C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, or Red Head/Phillips S Series.
- D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.
- E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series.

- F. Beam Clamps: Forged steel beam clamp, with weldless eye nut (right hand thread), steel tie rod, nuts, and washers, Grinnell's Fig No. 292 (size for load, beam flange width, and rod size required).
- G. Metal Deck Ceiling Bolts: B-Line Systems' Fig. B3019.

2.3 FASTENERS

- A. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 SHOP PAINTING AND PLATING

- A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint. Electroplated copper hanger rods, hangers and accessories shall be used when hangers are in direct contact with copper pipe or copper tubing.
- B. Hanger supports for chromium plated pipe shall be chromium plated brass.

2.5 ROOFTOP SUPPORT SYSTEMS

- A. Rooftop supports for piping equipment shall be provided for installation without requiring roof penetrations, flashing, or damage to the roofing material. Height-adjustable supports may be used where necessary. Support piping a minimum of 4" above the roof surface.
- B. Materials:
 - 1. Support bases shall be made of an engineered material with appropriate additives for UV protection. All structural steel components shall be hot-dipped galvanized.
 - 2. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. The support base will have a radiused edge to enhance compatibility with roof membranes.
 - 3. Coordinate static load rating of the support(s) with the specific application being served.
 - 4. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.
- C. Applications:
 - 1. Fixed Strut Pipe Hanger Supports: Size and load ratings for the application
 - 2. Adjustable Strut Pipe Hanger Supports: Height adjustable, size and load ratings for the application
 - 3. Adjustable Single Piping Supports: Height adjustable, size and load ratings for the application
 - 4. Block Supports: Size and load ratings for the application

5. Roller Supports: Height adjustable, size and load ratings for the application
 6. Bridge Assemblies:
 - a. Suitable for multiple piping runs or equipment
 - b. Size and load ratings for the application
 7. Post Base Assemblies:
 - a. For use with vertical sections of channel support systems
 - b. Size, channel support configuration, and load ratings for the application
- D. Acceptable Manufacturers:
1. Caddy/Pentair
 2. Cooper B-Line
 3. Mifab, Arlington
 4. Rooftop Blox
 5. Haydon
 6. MAPA Products
 7. Miro Industries

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not hang or support one (1) pipe from another or from ductwork.
- B. Do not bend threaded rod.
- C. Do not hang or support equipment from the bottom chord of joists.
- D. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.
- E. Space hangers or supports for horizontal piping on maximum center distances as listed in the documents, and as follows.
 1. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
 2. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
 3. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.

4. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be used. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

F. Size hanger rods in accordance with the following

PIPE SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4

1. Secure hanger rods as follows: Install one (1) nut under clevis, angle or steel member; one (1) nut on top of clevis, angle or steel member; one (1) nut inside insert or on top of upper hanger attachment and one (1) nut and washer against insert or on lower side of upper hanger attachment. A total of four (4) nuts are required for each rod, two (2) at upper hanger attachment and two (2) at hanger.
2. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.

G. Vertical Piping

1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
3. Support cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and 1/4 inch thick malleable iron or steel riser clamps with extension arms at each floor level, with the distance between clamps not to exceed 25 feet. Support cast iron risers in vertical shafts equivalent to the aforementioned.
4. Support hubless cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and by malleable iron or steel riser clamps with the extension arms at each floor level, with the distance between clamps or intermediate supports not to exceed 12 feet. Support risers in vertical shafts equivalent to the aforementioned.

- H. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

3.2 UPPER HANGER ATTACHMENTS

A. General

1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
2. Do not attach hangers to steel decks that are not to receive concrete fill.
3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.
2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
3. Do not drill holes in main structural steel members.
4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.

C. Attachment to Concrete Filled Steel Decks

1. New Construction: Install metal deck ceiling bolts.
2. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.
3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

E. Attachment to Existing Cast-In-Place Concrete

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

F. Attachment to Cored Precast Concrete Decks: Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.

G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.

2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.

H. Attachment to Waffle Type Concrete Decks

1. New Construction: Install cast-in-place inserts.
2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

I. Attachment to Precast Concrete Tee Construction

1. New Construction: Tee hanger inserts between adjacent flanges, except at roof deck without concrete fill.
2. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.
 - a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.
 - b. Do not use powder driven fasteners.

3.3 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

- A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner that will not affect the structural integrity of the building.

3.4 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

- A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.5 PIPE INSULATION SHIELDS

- A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

3.6 ROOFTOP SUPPORT SYSTEM

- A. Install in accordance with manufacturer's instructions and recommendations.
- B. Provide complete and adequate support of all piping and equipment.
- C. The use of wood blocks for supporting piping or equipment is not permitted.
- D. If gravel top roof, gravel must be removed around and under support.

- E. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (isolation pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.
- F. Use properly sized clamps to secure piping or equipment.

END OF SECTION

**SECTION 23 05 53
MECHANICAL IDENTIFICATION**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following Equipment Identification indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Items to be labeled
 - 1. Plumbing and Piping Valves
 - 2. Piping
 - 3. Equipment (Including but not limited to the following)
 - a. Pumps
 - b. Heat Exchangers
 - c. Dedicated equipment control panels (radiant in-floor heat zones)

1.2 REFERENCES

- A. ANSI A13.1 - Scheme for Identification of Piping Systems.

1.3 SUBMITTALS

- A. Product Data
 - 1. Manufacturer's catalog sheets and specifications for mechanical identification materials.
 - 2. Installation instructions.
 - 3. Schedule indicating what type of materials will be used for various equipment, valves, piping, and devices.

PART 2 - PRODUCTS

2.1 EQUIPMENT TAGS

- A. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.
- B. Plastic Tags: 1/16" thick, UV resistant phenolic plastic. Minimum 1-1/2" square or round laminated with engraved, 1/4" minimum black letters on light contrasting background.
- C. Tags shall be black with white lettering.

- D. Lettering: Lettering shall be supplier's normal font, minimum 1" high

2.2 VALVE TAGS

- A. Brass Tags: 1-1/2" Round 19 gauge brass tags with 1/4" minimum engraved letters.
- B. Plastic Tags: 1/16" thick, UV resistant phenolic plastic. 1-1/2" round laminated with engraved, 1/4" minimum black letters on light contrasting background.
- C. Tags shall be brass or white with solid black lettering.
- D. Provide with brass ball chain or plastic zip connectors to attach tag to valve

2.3 PIPE MARKERS AND ACCESSORIES

- A. Snap-on Marker: One (1) piece wrap around type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, 3/4 inch adhesive strip on inside edge, and 360 degree visibility.
- B. Strap-On Marker: Strip type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, factory applied grommets, and pair of stainless steel spring fasteners.
- C. Stick-On Marker: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flow arrow banding tape is not being used.
- D. Pipe Marker Legend and Color Field Sizes:

OUTSIDE DIAMETER OF PIPE OR INSULATION (Inches)	LETTER SIZE (Inches)	LENGTH OF COLOR FIELD (Inches)
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1-1/4	12
8 to 10	2-1/2	24
Over 10	3-1/2	32

- E. Banding Tapes: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating.
 - 1. Plain Tape: Unprinted type; color to match pipe marker background.
 - 2. Flow Arrow Tape: Printed type with integral flow arrows; color to match pipe marker background.
- F. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Complete testing, insulation and finish painting work prior to completing the Work of this Section.
- B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.
- C. Remove dust from insulation surfaces with clean cloths prior to installing piping identification.

3.2 PIPING IDENTIFICATION

- A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.
- B. Stick-On Pipe Markers:
 - 1. Install minimum of two (2) markers at each specified location, 90 degrees apart on visible side of pipe.
 - 2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.
- C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of two (2) pipe size labels at each specified location, 90 degrees apart on visible side of pipe.
- D. Underground Pipe Markers: Install 8-12" above buried piping. Install along entire length of pipe.

3.3 PIPING IDENTIFICATION SCHEDULE

- A. Piping Identification Types

Piping:	Field Color:	Lettering Color:
Heating Water	Yellow	Black
Snowmelt	Orange	Black
Steam, Condensate	Yellow	Black

- B. Locate piping identification as follows:
 - 1. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs.
 - 2. Where two (2) or more pipes run in parallel, place printed legend and other markers in same relative location.

3.4 EQUIPMENT IDENTIFICATION

- A. Install engraved tags on equipment using metal rivets or stainless steel sheet metal screws with a pan head. For indoor equipment, industrial strength double-sided tape is acceptable if rivets or screws cannot be used. Install label on most visible side of equipment. Place identification along center line of equipment, if possible.
- B. Label all mechanical equipment using the same callout as used on the drawings, by means of engraved tags.
- C. Label hidden equipment such as sump pumps on the control panel or disconnect if it does not make sense to label the equipment itself.

3.5 VALVE TAGS

- A. Valve tags shall be engraved with the following information:
 - 1. Service Abbreviation
 - 2. Valve number
- B. Service Abbreviation shall match piping nomenclature used on Drawings.
- C. Attach tags to valves, not valve handles or wheels.
- D. Trim excess from connecting strip or chain.
- E. Valve Schedule
 - 1. Provide a valve schedule that lists all valves not installed for individual plumbing fixtures. Valve schedule shall list the following information in order: service, tag number, size, usage (shut-off, balancing, control, etc.), name and number or room location, normally open or closed, pressure rating, manufacturer, model number, and installation date.
 - 2. Provide three (3) laminated hard copies and one (1) electronic copy in .pdf format. Hard copies shall be clearly legible and a minimum of 11" x 17".
 - 3. Mount one (1) of the hard copies in a solid metal frame in a location designated by the Owner.

3.6 SPECIAL CONDITIONS

- A. Additional labels shall be installed at the request of the Engineer/Owner.

END OF SECTION

**SECTION 23 05 93
CLEANING AND TESTING**

PART 1 - GENERAL

1.1 SCOPE

- A. Cleaning of systems to remove construction debris and prepare for testing and operation.
- B. Perform testing on systems and equipment to confirm they can withstand normal operating and design conditions as outlined in various equipment sections.
- C. Equipment Included in This Section
 - 1. Hydronic heating systems
 - 2. Steam and condensate piping systems

1.2 REFERENCES

- A. Balancing of Systems: Section 230594.

1.3 SUBMITTALS

- A. Quality Control Submittals
 - 1. Submit Field Test Reports for all systems to be tested.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.
 - 2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.5 PROJECT CONDITIONS

- A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gauges for field testing of systems.

1.6 SEQUENCING AND SCHEDULING

- A. Transmit written notification of proposed date and time of operational tests to the Architect / Engineer at least five (5) days in advance of such tests.

- B. Perform cleaning and testing Work in the presence of the Owner's Representative Architect / Engineer.
- C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems or temporary valves or caps as required to perform the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Test Equipment and Instruments: Type and kind as required for the particular system under test.
- B. Test Media (air, gas, refrigerant, dry nitrogen, vacuum, water): As specified for the particular piping or system under test.
- C. Cleaning Agent (chemical solution, steam, water): As specified for the particular piping, apparatus or system being cleaned.
- D. Propylene Glycol: Permanent type anti-freeze solution as manufactured by Dow Chemical Co. or Union Carbide.

PART 3 - EXECUTION

3.1 PRELIMINARY WORK

- A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.
- B. Thoroughly clean compressed air, control air, refrigerant pipe and similar systems prior to pressure or vacuum testing.
 - 1. Refrigerant Piping
 - a. Only use factory sealed refrigerant piping.
 - b. Crimp and braze caps on ends of previously cleaned piping at the end of the day if piping was cut.
 - c. When brazing, purge lines with dry nitrogen.

3.2 PRESSURE TESTING OF PIPING

- A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.

B. Water Systems

1. Circulating water systems, including propylene glycol solution systems and cold water make-up piping connections to heating, ventilating, air conditioning and refrigeration systems, unless otherwise specified:
 - a. Before final connections are made perform hydrostatic test at 1-1/2 times the maximum working pressure, but not less than 125 psig, for four (4) hours.
 - b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating system design pressure, but not less than 30 psig, for four (4) hours.
2. High temperature water systems (supply and return):
 - a. Before final connections are made perform hydrostatic test at 450 psig for four (4) hours.
 - b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating design pressure, but not less than 250 psig for four (4) hours.

- C. Steam, Condensate Return and Pump Discharge Piping: Before final connections are made perform hydrostatic test at 1-1/2 times maximum working pressure, but not less than 150 psig for one hour.

3.3 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

- A. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.4 HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS - CLEANING AND OPERATIONAL TESTING

A. Circulating Heating Hot Water Systems in Buildings

1. Cleaning
 - a. Flush systems and apparatus, upon completion of pressure test(s).
 - b. Completely open valves and flush each system with clean water, prior to chemical cleaning.
 - c. Repeatedly flush at short intervals until twice the system water capacity has been flushed through.
 - d. Chemically clean systems immediately following flushing operations.
 - e. Circulate a solution consisting of trisodium phosphate, in a proportion of one (1) pound of chemical to every 50 gallons of water in the system.
 - f. Completely fill system with cleaning solution; vent as required, and place in operation, with automatic controls operating and valves fully open.
 - g. Allow system to reach design operating temperature or an operating temperature designated by the Director's Representative.
 - h. Circulate the solution through the system for a minimum of four (4) consecutive hours; immediately drain system and flush with clean water until the pH at the farthest drain matches the clean water input.
 - i. Provide temporary pipe and /or hose required to drain system.
 - j. Keep strainers unplugged during cleaning operations. Remove and clean strainer screens prior to operational test.
 - k. Refill system with clean water and correct pH to 7.

- I. Do not flush steam piping thru steam coils. Provide temporary steam supply and condensate piping to bypass steam coils.
 - m. Upon completion of flushing, remove temporary piping and reconnect steam coil.
 2. Operational Test
 - a. Run system in an automatic mode for a minimum of 120 consecutive hours.
 - b. During this time, make final adjustments, including the setting of the balancing valves.
- B. Propylene Glycol Systems
 1. Clean as specified for circulating water systems.
 2. Perform operational test as specified for circulating water systems with propylene glycol solution in system.
- C. Steam Heating Systems
 1. Cleaning
 - a. Upon completion of pressure test(s), place the system in automatic operation, at a minimum 7 psig steam pressure unless otherwise directed by the Owner's Representative.
 - b. Maintain this pressure for a minimum of forty-eight (48) hours to remove dirt, sludge and foreign substances from the system. This includes all terminal devices.
 - c. During this time waste the condensate. Provide temporary piping to transport condensate to blowdown separator.
 - d. Allow condensate to cool below 140° F before wasting into sanitary drains.
 - e. Periodically blow down strainers during cleaning operations and totally clean strainers and trap elements at end of blow down.
 - f. Do not flush.
 - g. Test condensate quality periodically to ensure waste and boiler startup chemicals are no longer present prior to returning condensate to the system.
 2. Operational Test
 - a. Run system in an automatic mode for a minimum of 120 consecutive hours, with final connections made to apparatus, equipment and accessories.
 - b. Make final adjustments.

END OF SECTION

**SECTION 23 05 94
TESTING ADJUSTING AND BALANCING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required for complete Testing, Adjusting and Balancing of the systems as indicated by the Contract Documents with supplementary items necessary for proper system operation.
- B. Equipment included in This Section
 - 1. Hydronic Equipment (Heating)
 - a. Heat exchangers
 - b. Pumps

1.2 SUBMITTALS

- A. Certified TAB reports

1.3 QUALITY ASSURANCES

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.

1.4 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.5 PROJECT CONDITION

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

- A. Notice: Provide seven (7) days advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on water distribution systems have been satisfactorily completed.

1.7 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Heating-Water Flow Rate: Plus or minus 10 percent

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, engage one (1) of the following
 - 1. Precision Facility Solutions
 - 2. System Management and Balance
 - 3. System Works

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design". Compare results with the design data and installed conditions.

- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine system pumps to ensure absence of entrained air in the suction piping.
- M. Examine operating safety interlocks and controls on HVAC equipment.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Isolating and balancing valves are open and control valves are operational.
 - 6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in this specification and one of the following:
 - 1. AABC's "National Standards for Total System Balance"
 - 2. ASHRAE 111

3. NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"
 4. SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing"
- B. Comply with requirements of the adopted version of ASHRAE 62.1, Section on balancing.
- C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation".
- D. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- E. Take and report testing and balancing measurements in inch-pound (IP).

3.5 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
1. Open all manual valves for maximum flow.
 2. Check liquid level in expansion tank.
 3. Check makeup water-station pressure gauge for adequate pressure for highest vent.
 4. Check flow-control valves for specified sequence of operation and set at indicated flow.
 5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
 6. Set system controls so automatic valves are wide open to heat exchangers.
 7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
 8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.6 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
 - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 2. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer and comply with requirements in Division 23 Section "Hydronic Pumps."
 - 3. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - 4. Monitor motor performance during procedures and do not operate motors in overload conditions.
 - 5. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 - 6. Report flow rates that are not within plus or minus ten (10) percent of design.
- B. Confirm a desirable operating pressure is achieved to allow for the most critical / restrictive device to reach the scheduled flow. Note which device and the system operating parameters at this condition.
- C. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- D. Set calibrated balancing valves, if installed, at calculated presettings.
- E. Measure flow at all stations and adjust, where necessary, to obtain first balance.
 - 1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- F. Measure flow at main balancing station and set main balancing device to achieve flow that is five (5) percent greater than indicated flow.
- G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
 - 1. Determine the balancing station with the highest percentage over indicated flow.
 - 2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
 - 3. Record settings and mark balancing devices.

- H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- J. Check settings and operation of each safety valve. Record settings.

3.7 PROCEDURES FOR STEAM SYSTEMS

- A. Record the steam pressures in the system via installed pressure gauges or pressure sensors that are part of the building automation system, boilers, PRV's or other system components.
- B. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.
- C. Check settings and operation of each safety valve. Record settings.
- D. Verify the operation of each steam trap.

3.8 PROCEDURES FOR HEAT EXCHANGERS

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.
- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

3.9 FINAL REPORT

- A. General: Prepare a certified written report;
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves
 - 2. Manufacturers' test data
 - 3. Field test reports prepared by system and equipment installers
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data

- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page
 2. Name and address of the TAB contractor
 3. Project name
 4. Project location
 5. Architect's name and address
 6. Engineer's name and address
 7. Contractor's name and address
 8. Report date
 9. Signature of TAB supervisor who certifies the report
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - d. Nomenclature sheets for each item of equipment.
 - e. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - f. Notes to explain why certain final data in the body of reports vary from indicated values.
 12. Test conditions for fans and pump performance forms including the following:
 - a. Cooling coil, wet- and dry-bulb conditions.
 - b. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Water and steam flow rates.
 2. Pipe and valve sizes and locations.
 3. Balancing stations.
 4. Position of balancing devices.

3.10 INSPECTIONS

A. Initial Inspection

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
 - a. Measure airflow of at least ten (10) percent of air outlets.
 - b. Measure water flow of at least five (5) percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Verify that balancing devices are marked with final balance position.
 - e. Note deviations from the Contract Documents in the final report.

B. Final Inspection

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal eight (8)-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than ten (10) percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

- D. Prepare test and inspection reports.

3.11 ADDITIONAL TESTS

- A. Within ninety (90) days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

**SECTION 23 07 19
PIPING INSULATION**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the Piping Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Pipe Hangers and Supports: Section 230529.
- B. Abbreviations
 - 1. K: Thermal Conductivity, i.e., maximum Btu per inch thickness per hour per square foot.
 - 2. pcf: Pounds per cubic foot.
 - 3. PVC: Polyvinylchloride.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's catalog sheets and specifications for the following:
 - 1. Insulation Materials.
 - 2. Jacket Materials.
 - 3. Sealant and Adhesive Materials.

1.4 QUALITY ASSURANCE

- A. Qualifications: The person(s) directly supervising the installation of this work in the field shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of five (5) years.
- B. Regulatory Requirements
 - 1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.
 - 2. Insulation shall meet minimum requirements ASHRAE 90.1-2007.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

- A. Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.
 - 1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547
 - a. Class 1 (Suitable for Temperatures Up to 450° F): K of 0.26 at 75° F.
 - 2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75° F; ASTM C 547, Class 1.
 - 3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75° F; ASTM C 553, Type III. Suitable for temperatures up to 450° F.
- B. Flexible Elastomeric Foam Insulation
 - 1. FM tested and approved, meeting the following:
 - a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
 - b. K of 0.27 at 75° F based on ASTM C 518 or C 177.
 - 2. Pipe Insulation: ASTM C 534, Type I.
 - 3. Polyethylene and polyolefin insulation is not acceptable.
- C. High Density Jacketed Insulation Inserts for Hangers and Supports
 - 1. For Use with Fibrous Glass Insulation:
 - a. Cold Service Piping:
 - 1) Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75° F, minimum compressive strength of 125 psi.
 - b. Hot Service Piping:
 - 1) Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300° F; ASTM C 533.
 - 2) Perlite: Minimum density 12 pcf, K of 0.60 at 300° F; ASTM C 610.
 - 2. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.
- D. Cements
 - 1. Fibrous Glass Thermal Insulating Cement: Asbestos free; ASTM C 195.
 - 2. Fibrous Glass Hydraulic Setting Thermal Insulating and Finishing Cement: ASTM C 449/C 449M.

2.2 INSULATION JACKETS

- A. Laminated Vapor Barrier Jackets for Piping: Factory applied by insulation manufacturer, conforming to ASTM C 1136, Type I.
 - 1. Type I: Reinforced white kraft and aluminum foil laminate with kraft facing out.
 - a. Pipe Jackets: Furnished with integral 1-1/2" self sealing longitudinal lap, and separate 3" wide adhesive backed butt strips.
 - 2. Laminated vapor barrier jackets are not required for flexible elastomeric foam insulation.
- B. Canvas Jackets: Cotton duck, fire retardant, NFPA 701 compliant, 4 or 6 oz. per square yard as specified.
- C. PVC Jackets and Premolded Fitting Covers
 - 1. Constructed of high impact, UV resistant PVC. 0.020" thickness.
 - a. ASTM D 1784, Class 14253-C.
 - b. Working Temperature: 0-150° F.
- D. Metal Jacketing
 - 1. Aluminum: ASTM B 209, Alloys 1100, 3003, 3105 or 5005, Temper H14, 0.016 inch thick.
 - a. Factory Pre-formed Sectional Pipe Jacketing:
 - 1) Smooth outer finish with integral bonded laminated polyethylene film, kraft paper moisture barrier underside.
 - 2) Pittsburgh or modified Pittsburgh longitudinal lock seams.
 - 3) 2 inch overlapping circumferential joints with integral locking clips, or butt joints sealed with 2 inch wide mastic backed aluminum snap bands.
 - b. Fastening Devices:
 - 1) Strapping: Type 18-8 stainless steel, 0.020" thick, 1/2" and 3/4" wide as specified.
 - 2) Wing Seals: Type 18-8 stainless steel, 0.032" thick.
- E. Self-Adhesive Outdoor Jackets:
 - 1. Self-Adhesive Outdoor Jacket: 15-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located above ground and outdoors; consisting of a multi-layered laminate coating with acrylic adhesive covered with [flat silver] aluminum-foil facing.
- F. Removable Insulation Covers: Advance Thermal Corp., or Prior Approved Equal.
 - 1. Construction: Teflon or silicon coated canvas blanket. Insulation shall match insulation thickness or be as thick as possible.
 - 2. Fasteners: A minimum of Velcro, double-loop d-rings, and laces.
 - 3. Use materials that are rated for an application's specific temperature requirements, e.g. use high temperature (800° F) rated products for generator exhaust flues.

2.3 ADHESIVES, MASTICS, AND SEALERS

A. Adhesives

1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Calcium silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 - 800° F (10 - 427° C).
3. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive with a service temperature range of -75°F to +300°F (-59°C to +149°C)
4. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
5. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
6. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
7. PVC Jacket Adhesive: Compatible with PVC jacket.

B. Mastics

1. For indoor applications, use mastics that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

C. Lagging Adhesives

1. For indoor applications, use adhesive that has a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

D. Sealants

1. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).
2. Vapor Seal Adhesive (Fibrous Glass Insulation): Childers' CP-82, Epolux's Cadoprene 400, Foster's 85-75 or 85-20.
3. Vapor Barrier Mastic/Joint Sealer (Fibrous Glass Insulation): Childers' CP-30, Epolux's Cadalar 670, Foster's 95-44 or 30-35.
4. Adhesive (Flexible Elastomeric Foam): Armstrong's 520, Childers' CP-80, Epolux's Cadoprene 488, Foster's 82-40.
5. Sealant (Metal Pipe Jacket): One-part silicone sealant for high temperatures; Dow Corning's Silastic 736 RTV or General Electric's RTV 106.

2.4 MISCELLANEOUS MATERIALS

- A. Pressure Sensitive Tape for Sealing Laminated Jackets:
 - 1. Acceptable Manufacturers:
 - a. Alpha Associates
 - b. Childers
 - c. Ideal Tape
 - d. Morgan Adhesive
 - 2. Type: Same construction as jacket.
- B. Wire, Bands, and Wire Mesh:
 - 1. Binding and Lacing Wire: Nickel copper alloy or copper clad steel, gauge as specified.
 - 2. Bands: Galvanized steel, 1/2" wide x 0.015" thick, with 0.032" thick galvanized wing seals.
 - 3. Wire Mesh: Woven 20-gauge steel wire with 1" hexagonal openings, galvanized after weaving.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform the following before starting insulation Work:
 - 1. Install hangers, supports and appurtenances in their permanent locations.
 - 2. Complete testing of piping.
 - 3. Clean and dry surfaces to be insulated.

3.2 INSTALLATION, GENERAL

- A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions unless otherwise specified.
- B. Provide continuous piping insulation and jacketing when passing thru interior wall, floor, and ceiling construction.
 - 1. At Through Penetration Firestops: Coordinate insulation densities with the requirements of approved firestop system being installed. See Section 078400.
 - a. Insulation densities required by approved firestop system may vary with the densities specified in this Section. When this occurs use the higher density insulation.
- C. Do not intermix different insulation materials on individual runs of piping.

3.3 INSTALLATION AT HANGERS AND SUPPORTS

- A. Reset and realign hangers and supports if they are displaced while installing insulation.
- B. Install high density jacketed insulation inserts at hangers and supports for insulated piping.
- C. Insulation Inserts For Use with Fibrous Glass Insulation
 - 1. Where clevis hangers are used, install insulation shields and high density jacketed insulation inserts between shield and pipe.
 - a. Where insulation is subject to compression at points over 180° apart, e.g. riser clamps, U-bolts, trapezes, etc.; fully encircle pipe with two (2) protection shields and two (2) high density jacketed fibrous glass insulation inserts within supporting members.
- D. Insulation Inserts For Use with Flexible Elastomeric Foam Insulation:
 - 1. Where clevis hangers are used, install insulation shields with hardwood filler pieces, same thickness as adjoining insulation, inserted in undersized die cut or slotted holes in insulation at support points.
 - 2. Contour hardwood blocks to match the curvature of pipe, and shield.
 - 3. Coat dowels and blocks with insulation adhesive, and insert while still wet.
 - 4. Vapor seal outer surfaces of dowels and blocks with adhesive after insertion.
 - 5. Install filler pieces as follows:

PIPE/TUBING SIZE	FILLER PIECES	POSITION
Thru 1-1/2"	2 dowel plugs	6 o'clock; in tandem
2" thru 4"	1 block, 2 dowel plugs	6 o'clock, and 4 & 8 o'clock respectively
6" thru 8"	2 blocks, 4 dowel plugs	6 o'clock; in tandem and 4 & 8 o'clock; in tandem

3.4 INSTALLATION OF FIBROUS GLASS HOT SERVICE INSULATION

- A. Install insulation materials with field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket unless otherwise specified.
- B. Piping
 - 1. Butt insulation joints together, continuously seal minimum 1-1/2" wide self-sealing longitudinal jacket laps and 3" wide adhesive backed butt strips.
 - a. Substitution: 3" wide pressure sensitive sealing tape, of same material as the jacket, may be used in lieu of butt strips.

2. Fill voids in insulation at hanger with insulating cement.
3. Exceptions:
 - a. Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Spaces and Concealed Piping: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips of same material as jacket, with outward clinching staples on maximum 4" centers. Fill voids in insulation at hangers with insulating cement.
 - b. Piping in Tunnels: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips, of same material as jacket, with outward clinching staples on maximum 4" centers and 16 gauge wires a minimum of four (4) loops per section. Fill voids in insulation with insulating cement.

C. Fittings, Valves, Flanges and Irregular Surfaces

1. Insulate with mitre cut or pre-molded fitting insulation of same material and thickness as insulation.
2. Secure in place with 16-gauge wire, with ends twisted and turned down into insulation.
3. Butt fitting, valve and flange insulation against pipe insulation, and fill voids with insulating cement.
4. Insulate valves up to and including bonnets, without interfering with packing nuts.
5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
6. After insulating cement has dried, coat insulated surface with lagging adhesive, and apply 4 oz or 6 oz canvas jacket as required by pipe size.
 - a. Lap canvas jacket on itself and adjoining pipe insulation at least 2".
 - b. Size entire canvas jacket with lagging adhesive.
7. Piping Systems (below 250° F)
 - a. Valves, fittings and flanges may be insulated with pre-molded PVC fitting jackets, with fibrous glass insulation inserts.
 - 1) The surface temperature of PVC fitting jacket not to exceed 150° F.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

- A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive.
 1. Where the slip-on technique is not possible, slit the insulation and install.
 2. Re-seal with adhesive, making sure the mating surfaces are completely joined.
- B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.
 1. Insulate threaded fittings and valves with sleeved fitting covers. Overlap and seal the covers to the adjoining pipe insulation with adhesive.

- C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.
- D. Piping Exposed Exterior to a Building, Totally Exposed to the Elements:
 - 1. Apply flexible elastomeric foam insulation to piping with adhesive.
 - 2. Apply reinforcing membrane around piping insulation with adhesive or mastic.
 - 3. Adhesive Applied System: Apply two (2) coats of finish.
 - 4. Mastic Applied System: Apply another coat of mastic over reinforcing membrane.

3.6 INSTALLATION OF METAL JACKETING ON PIPING

- A. Secure jacketing to insulated piping with preformed aluminum snap straps and stainless steel strapping installed with special banding wrench.
- B. Jacket fittings, valves and flanges with mitred sections of aluminum jacketing.
 - 1. Seal joints with sealant and secure with preformed aluminum bands.
 - 2. Factory fabricated, preformed, sectional aluminum fitting covers may be used in lieu of mitred sections of aluminum jacketing for covering fittings, valves and flanges.

3.7 INSTALLATION OF REMOVABLE INSULATION COVERS

- A. Install Removable Insulation Covers in lieu of field applied insulation on the following items:
 - 1. Uninsulated headers of shell-and-tube heat exchangers.

3.8 FIELD QUALITY CONTROL

- A. Field Samples: The Owner's Representative, may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Contractor shall reinsulate sample cut areas.

3.9 EQUIPMENT INSULATION SCHEDULE

- A. Unless factory insulated, contractor shall insulate the following with the same thickness and material as the piping system they serve:
 - 1. Hydronic Water Air Separators and Buffer Tanks
 - 2. Steam-to-Water, Glycol/Water-to-Water, and Steam-to-Steam Heat Exchangers
 - 3. Heating Water Pumps and Accessories

3.10 PIPING INSULATION SCHEDULE

- A. Refer to Piping Application Schedule on Drawings for Piping Insulation Schedule.
- B. Insulate all cold service and hot service piping, and appurtenances except where otherwise specified.
- C. Schedule of items not to be insulated:
 - 1. Do not insulate the following items:
 - a. Actual heat transfer surfaces.
 - b. Chromium plated piping, unless otherwise specified.
 - c. Flexible vibration eliminators.
 - d. Water meters.
 - e. Drains from heating equipment and appurtenances that flow to waste.
 - f. Chemical feed piping.
 - g. Piping inside convector and finned tube radiation enclosures.
 - h. Boiler blow-off and blow-down piping.
 - i. Safety and relief valves. Discharge piping from relief valves.
 - j. Vent piping to atmosphere installed exposed in Mechanical Rooms, connected to the following: Blow-off tanks, flash tanks, condensate tanks.
 - k. Flanges and unions in piping systems over 140° F.
 - l. Hydronic Specialties: Flow indicators, control valves 3" and under, air vents and air control fittings.
 - m. Steam traps and cooling legs of steam traps.
 - n. Float chambers and level controllers.
 - 2. Do not insulate mechanical equipment with a factory applied insulated steel jacket, unless specified otherwise.

3.11 SCHEDULE OF METAL JACKETING FOR INSULATED PIPE

- A. Piping Exterior to Building: Jacket insulated piping with circumferentially corrugated aluminum jacketing.
 - 1. Lap longitudinal and circumferential joints a minimum of 2".
 - 2. Secure jacketing in place with 1/2" x 0.020" thick aluminum bands secured with aluminum wing type seals, on maximum 12" centers.
 - 3. Cover insulated fittings, valves, and offsets with mitered sections of jacketing. Seal joints with mastic, and secure with aluminum strapping and wing seals.
 - 4. Factory fabricated, preformed fitting covers of same material as jacketing may be used instead of mitered jacketing.
 - 5. Install jacketing so as to avoid trapping condensation and precipitation.

3.12 SCHEDULE OF ALUMINUM JACKETING FOR INSULATED PIPE

- A. Jacket exposed insulated piping on roof with aluminum jacketing.

END OF SECTION

**SECTION 23 21 13
HYDRONIC PIPING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all work required to provide and install the following Hydronic Piping Systems indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Include all piping, fittings, specialties, and equipment needed for proper installation.
- C. Included in this section is piping for the following systems
 - 1. Glycol Water
 - 2. Heating Water

1.2 REFERENCES

- A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. The adopted version of the Uniform Plumbing Code shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Use only materials and methods allowed by applicable codes and authority having jurisdiction (AHJ). It is the contractor's responsibility to confirm if plastic piping is acceptable with the AHJ prior to installation.
- B. Qualification of Brazers
 - 1. Comply with the following: The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.
- C. Pipe Welding: Qualify processes and operators according to the following:
 - 1. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME

label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

- E. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe for Threading or Welding: Standard weight, Schedule 40, black; ASTM A 53/ A 53M or ASTM A 135.
- B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black; ASTM A 53, Grade B, Type F for sizes 3/4" to 1-1/2", and Type E or S for sizes 2" to 24", or ASTM A 135.
- C. Malleable Iron, Steam Pattern Threaded Fittings
 - 1. 150 lb Class: ASME B16.3.
- D. Cast Iron Fittings
 - 1. Drainage Pattern, Threaded: ASME B16.12.
 - 2. Steam Pattern, Threaded: ASME B16.4.
 - a. Standard Weight: Class 125.
 - 3. Flanged Fittings and Threaded Flanges: ASME B16.1.
 - a. Standard Weight: Class 125.
- E. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- F. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- G. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.
- H. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- I. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.2 COPPER AND BRASS PIPE, TUBING AND FITTINGS

- A. Copper Tube, Types K and L: ASTM B 88
- B. Wrought Copper Tube Fittings, Solder Joint: ASME B16.22
- C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18
- D. Drainage Tube, Type DWV: ASTM B 306
- E. Wrought Copper Drainage Tube Fittings, Solder Joint: ASME B16.29
- F. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23
- G. Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solder joint

2.3 DUCTILE IRON PIPE AND FITTINGS

- A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151
 - 1. 6" and Over: Class 50
- B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110

2.4 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

- A. Couplings: Gruvlok Fig. 7401 or 74, or Victaulic Co.'s Style 07 or 107, having minimum pressure rating of:
 - 1. 750 psi from 1-1/2" to 4"
 - 2. 700 psi for 6"
 - 3. 600 psi for 8"
- B. Couplings: Gruvlok Fig. 7001 or Victaulic Co.'s Style 77, having pressure rating of:
 - 1. 1000 psi for 3/4" to 6"
 - 2. 800 psi for 8" to 12"
 - 3. 300 psi for 14" to 24"
- C. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:
 - 1. Steel: ASTM A 53 or A 106, Grade B
 - 2. Malleable Iron: ASTM A 47
 - 3. Ductile Iron: ASTM A 536

2.5 PVC PIPING AND FITTINGS

- A. Pipe: Schedule 80 PVC, Type I, rated for 140° F, ASTM D 2466
- B. Fittings: Same as pipe manufacturer. Solvent welded using solvent approved by manufacturer.

2.6 ELBOWS

- A. All pipe elbows shall be long radius type, minimum 1.5 times pipe diameter.

2.7 JOINING AND SEALANT MATERIALS

- A. Thread Sealant
 - 1. LA-CO Industries', Slic-Tite Paste with Teflon
 - 2. Loctite Corp.'s No. 565 Thread Sealant
- B. Solder: Solid wire type conforming to the following:
 - 1. Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB)
- C. Flange Gasket Material
 - 1. Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.
- D. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.
- E. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

2.8 STRAINERS

- A. Acceptable Manufacturers
 - 1. Crane
 - 2. Nibco
 - 3. Victaulic
 - 4. Watts

5. Metraflex

B. Y-Pattern Strainers

1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for strainers 2" and smaller; flanged or grooved ends for strainers 2-1/2" and larger.
3. Strainer Screen: Stainless-steel, 0.125" diameter holes. Free area through the screen shall be at least 2-1/2 times the pipe area in which it is installed.
4. Maximum Working Pressure Rating: 250-psig working pressure.
5. Pressure Drop: Maximum of 1-psig pressure drop at design flow.
6. Pressure Rating: 175-psig working pressure at 150° F.

2.9 AIR VENTS AND VACUUM BREAKERS

A. Acceptable Manufacturers

1. Armstrong International, Inc.
2. Hoffman Specialty; Division of ITT Industries
3. Spirax Sarco, Inc.
4. Taco
5. Metraflex

B. Air Vents

1. Body: Cast brass
2. End Connections: Threaded
3. Float, Valve, and Seat: Stainless steel
4. Built-in check valve
5. Maximum Working Pressure: 150-psig working pressure at 250° F

C. Vacuum Breakers

1. Body: Cast iron, bronze or stainless steel
2. End Connections: Threaded
3. Sealing Ball, Retainer, Spring, and Screen: Stainless steel
4. O-ring Seal: EPR

2.10 THERMOMETERS

A. Acceptable Manufacturers

1. Weiss Instruments
2. Prior approval

B. Liquid in Glass Thermometers

1. Body: Molded plastic with variable angle mounting compliant with ASME B40.200.
2. Tube: Glass with magnifying lens, Blue organic liquid, nonreflective aluminum with permanently etched scale markings graduated in deg. F and deg. C.
3. Stem: Aluminum or brass and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.
4. Connector: $\frac{3}{4}$ inch, with ASME B1.1 screw threads.
5. Accuracy: Plus or minus 1 percent of scale range or one scale division, to maximum of 1.5 percent of scale range.
6. See piping application schedule for thermometer range requirements based on system type.

2.11 AIR SEPARATOR

A. Acceptable Manufacturers

1. Amtrol
2. Armstrong
3. Bell & Gossett
4. Elbi
5. Grundfos
6. Spirotherm
7. Taco

B. Body: Carbon steel with epoxy paint. Designed and constructed per ASME Section VIII, Division 1.

C. Connections: Flanged or grooved main inlet and outlet connections, minimum size equal to piping main. Threaded bottom blowdown connection. Threaded top connection.

D. Strainer: Removable, galvanized steel, 50% free area

E. Maximum Working Pressure: 125-psig working pressure at 350° F

- F. Pressure Drop: Maximum of 1-psig pressure drop at design flow
- G. Provide with automatic air vent

2.12 EXPANSION TANK

- A. Acceptable Manufacturers
 - 1. Amtrol
 - 2. Armstrong
 - 3. Bell & Gossett
 - 4. Elbi
 - 5. Grundfos
 - 6. Taco
- B. Body: Carbon steel with epoxy paint. Designed and constructed per ASME Section VIII, Division 1. Lifting rings and floor mounting skirt for vertical installation.
- C. Bladder: Replaceable, heavy-duty butyl rubber.
- D. Connections: Threaded top connection and drain. Standard tire valve charging connection.
- E. Pre-charged to 12 psig.
- F. Maximum Working Pressure: 125-psig working pressure at 240° F.
- G. Provide with automatic air vent.

2.13 DIELECTRIC CONNECTORS

- A. Use for all connections between piping connections of dissimilar materials.
- B. Unions
 - 1. Rated 250 psig at 180° F; ASME B16.39; Wilkins Model DU.
 - 2. Rated 100 psig at 210° F; ASME B16.39; Wilkins Model DU with high temperature gasket.
 - 3. Rated Above 100 psig and 210° F: Use Flange Electrical Insulation Kit specified below.
- C. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.
 - 1. Rated 150 psi at 250° F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and mylar sleeves; Model 150 by APS, Lafayette, LA.

2.14 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

- A. Oiled Oakum
- B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.15 PIPE SLEEVES

- A. Type A: Schedule 40 steel pipe
- B. Type B: No. 16 gauge galvanized sheet steel
- C. Type C: Schedule 40 steel pipe with 1/4" steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.
- D. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.

2.16 PIPING ESCUTCHEONS

- A. Only required where piping penetrates a finished wall below ceiling level.
- B. Cast Brass: Polished chrome plated finish, with set screw
- C. Cast Iron: Solid type, unplated, with set screw; Model 395 by Grinnell Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Use indicated piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, and other design considerations.
- B. Install piping at approximate locations indicated, and at maximum height.
- C. Install piping clear of door swings, and above sash heads.
- D. Make allowances for expansion and contraction.
- E. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.
- F. Install horizontal piping with a constant pitch, and without sags and humps.
 - 1. Water Piping: Pitch 1/4" per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch, establish a new low point and continue. At

the low point, provide a 1/2" drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.

- G. Install vertical piping plumb.
- H. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install 3/4" nipple and full port ball valve in blowdown connection of strainers 2" and larger. Match size of strainer blowoff connection for strainers smaller than 2".
- I. Strainers are not required for fin tube radiation and convectors.
- J. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- K. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube, and mechanically extracted joints in Type L copper tubing.
- L. Cut pipe and tubing ends square; ream before joining.
- M. Threading: Use American Standard Taper Pipe Thread Dies.
 - 1. Thread brass pipe with special brass threading dies.
- N. Install manual air vents at all high points in the piping and as shown on the Drawings. Install threaded cap on vent discharge.

3.2 HYDRONIC PIPING SYSTEMS

- A. Connect branch lines to the upper quadrant of the main, and run upward at not less than 45 degrees before extending laterally.
- B. Make final connections to equipment with unions, or flanges.
 - 1. Do not use unions in ferrous piping larger than 3".
 - 2. Do not use unions in brass or copper piping larger than 2-1/2".

3.3 PIPE JOINT MAKE-UP

- A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.
- B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.
- C. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- D. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
 - 1. Cut grooved end piping is not acceptable.

- E. Welded Joints: Construct joints according to AWS D10.12 (AWS D10.12M), using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Welded Steel Pipe
 - 1. All welding shall be done in accordance with the ANSI B-31.1 and the ASME welding code.
 - 2. Pipe ends on welded pipe lines shall be suitably beveled to permit butt-welding.
 - 3. All welds shall be of sound metal thoroughly fused to the base metal and penetrating to the bottom of the joints.
 - 4. Use welding bends in changing pipe directions. Mitered joints will not be accepted.
 - 5. Welders shall be experienced in the type of work to be done. Any welder, who, in the opinion of the Architect/Engineer or Construction Representative, is not competent to perform the work required, shall be dismissed from the job. At no time shall any welder not approved by the Architect/Engineer be allowed to weld pipe on the project.
 - 6. All welders shall be certified under the procedure of the ANSI B-31.1 and the ASME Welding Code, Section 9, for the thickness and type of high pressure piping and equipment they work on.

3.4 TERMINAL EQUIPMENT CONNECTIONS

- A. Size for supply and return piping connections shall be the same as or larger than equipment connections.

3.5 PIPING PENETRATIONS

- A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

CONSTRUCTION	SLEEVE TYPE
1. Frame construction	None Required
2. Foundation walls	A*
3. Non-waterproof interior walls	B*
4. Non-waterproof interior floors on metal decks	D*
5. Non-waterproof interior floors not on metal decks	B*
6. Floors over mechanical equipment, steam service, machine, and boiler rooms	A
7. Earth supported concrete floors.	None Required
8. Exterior concrete slabs on grade	A
9. Metal roof decks	C

10. Non-metal roof decks. A

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

B. Diameter of Sleeves and Core Drilled Holes

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.
2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
 - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of pipe, unless otherwise specified.
 - b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of insulation, unless otherwise specified.
 - c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

C. Length of Sleeves (except as shown otherwise on Drawings)

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2" above the finished floor level, except as follows:
 - a. In furred spaces at exterior walls, extend sleeve one" above the finished floor level.
3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2" above the concrete slab.
4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

D. Packing of Sleeves and Core Drilled Holes

1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
2. Pack sleeves in exterior walls below grade and concrete slabs with mechanical modular seals.

3.6 ESCUTCHEONS

A. Install plates for exposed piping passing thru floors, walls, and ceilings as follows:

1. In Finished Spaces: chrome plated cast brass.
2. Fasten plates with set screws.

3.7 PIPE AND FITTING SCHEDULE

A. Refer to Drawings for Piping Application Schedule.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping with welded joints and fittings according to ASME B31.9, "Building Services Piping," and as follows:
 - 1. Leave joints, including welds, un-insulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush system with clean water. Clean strainers.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
 - 3. After hydrostatic test pressure has been applied for at least ten (10) minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.

- C. Prepare written report of testing.

END OF SECTION

**SECTION 23 21 23
HVAC PUMPS**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install HVAC pumps indicated by the Contract Documents, with supplementary items necessary for the proper installation and operation.
- B. Work shall include all required trim components, including all related appurtenances to make a complete, functioning and operational system that will pump hydronic fluid for HVAC use.

1.2 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ANSI/UL 778 - Motor Operated Water Pumps.
 - 2. ANSI B58.1 – American Standard for Vertical Turbine Pumps.

1.3 SUBMITTALS

- A. Product Data
 - 1. Submit shop drawings and product data. Provide make, model number, impeller size and range, overall dimensions and weights of pump units, center of gravity location, framing, base-plate, and anchoring devices. Provide documentation of electrical motor frame size, hp rating, and all electrical characteristics.
 - 2. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve. For each pump with a motor horsepower greater than 2 hp, submit a certified shop performance test curve indicating capacity, head, horsepower and flow rates from shutoff to 125 percent of design flow.
 - 3. For centrifugal pumps, include certification that pump impeller diameter is less than 85 percent of the diameter of the maximum impeller possible (not to exceed cutwater diameter) for the pump casing, and that fabricated structural steel base is of sufficient strength to prevent vibration, warping or misalignment of the pump.

B. Operation and Maintenance Data

1. Installation instructions, assembly views, lubrication instructions, and replacement parts list. Assembly Drawings and repair parts lists for each device, i.e., for the pumps, the motors and variable speed motor controllers as scheduled. Drawings and literature provided shall relate to the actual units being furnished.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in the manufacture, assembly, and field performance of pumps with minimum three (3) years experience.

1.5 EXTRA MATERIALS

- A. Provide one (1) set of replacement seals for each size pump.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Pumps shall operate at 1750 rpm, unless specified otherwise. Pump 1st critical speed shall be no less than 120 percent of the running speed listed in the schedule. Statically and dynamically balance all rotating parts.
- C. Capacity test for design flow after final assembly.
- D. Complete pump assembly, including casing, flanges and seals, suitable for the service intended and working pressure and temperatures scheduled for the systems. Scheduled working pressure applies to the entire pump assembly including the suction and discharge flanges.
- E. Pumps to be complete with grease-lubricated ball or roller bearings, grease fittings and relief plugs, unless stated otherwise. For insulated pumps, extend grease fittings to exterior of insulation jacket with small diameter strong tubing, with no movement of extended grease assembly during operation.
- F. Seals: Carbon construction, rotating against stationary ceramic seat, suitable for the intended application of fluid and temperatures.
- G. Pumps shall be free of flashing and cavitation at all flow rates from 25 to 125 percent of design flow under the suction conditions of the actual pump installation.
- H. Pump connections shall be flanged. End suction, base mounted pumps with connection sizes 2-1/2 inches and less may be threaded.
- I. Heating hot water pumps shall be suitable for handling water at 230° F.

- J. Pumps shall not operate within the motor service factor. Pump motors shall not overload throughout their entire operating curve.
- K. Pumps shall be painted with suitable paint for operating environment and fluid temperatures.
- L. Provide chilled water pumps with extended steel base large enough to receive all drip from suction and discharge flanges.
- M. Motors: Provide premium efficiency ODP motors (for indoor service) or TEPC Motors (for outdoor service) in total compliance with specification requirements indicated elsewhere.

2.2 IN-LINE PUMP

- A. Type: Centrifugal, single stage, close coupled in-line, back pullout design, suitable for horizontal or vertical operation.
- B. Casing: Cast iron, rated for greater of 125 psi or 1.5 times actual discharge working pressure, suction and discharge gauge port, air vent, wear rings, seal flush connection, drain plug, flanged suction and discharge.
 - 1. Select casing to accommodate an impeller 15 percent greater in diameter than the diameter of the impeller actually selected to meet the specified conditions.
 - 2. Equip casing with tapped openings for vent drain and seal flush. Fit tops with petcocks and pipe for seal flush.
 - 3. Provide suction and discharge tapped for gauge connection.
- C. Impeller: Bronze, fully enclosed, keyed to shaft and secured with locknut.
- D. Shaft: Stainless steel or carbon steel with bronze or stainless steel sleeve through seal chamber.
- E. Seals: John Crane Company, Type 1 or 2 mechanical seals suitable for the intended application.
- F. Acceptable Manufacturers:
 - 1. Armstrong
 - 2. Aurora
 - 3. Bell & Gossett
 - 4. Grundfos
 - 5. Peerless
 - 6. Patterson
 - 7. Taco

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Installation shall permit complete servicing without breaking piping or motor connections.
- D. Provide access space around pumps for service. Provide no less than a minimum of three (3) feet, not including piping and piping appurtenances.
- E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation and operate within 15 percent of midpoint of published maximum efficiency curve.
- F. Decrease piping from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge lines for sizes 4 inches and larger.
- G. Provide line-sized shut-off valve and strainer on pump suction side and line sized soft seated check valve and balancing valve on pump discharge.
- H. Provide air cock and drain connection on horizontal pump casings.
- I. Provide drains for bases and seals, piped to and discharging into floor drains.
- J. Lubricate pumps before Start-up.
- K. Prior to Start-up, level and align pump baseplate, pump and driver. Provide metal supporting blocks, wedges and shims as required. Rigidly bolt pump base plate to the concrete base. For centrifugal pumps 25 horsepower and larger, dowel the pump and motor to the base after final alignment.
- L. Mount nameplate as described in Section 230553, on both pump motors and gauge board.

END OF SECTION

**SECTION 23 22 13
STEAM AND CONDENSATE HEATING PIPING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the steam and condensate piping indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment Included in This Section
 - 1. Pipe and fittings
 - 2. Strainers
 - 3. Thermostatic air vents and vacuum breakers

1.2 REFERENCES

- A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. The adopted version of the Uniform Plumbing Code shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

- A. Submit piping layout drawings as per Section 230500.
- B. Product Data: For each type of the following:
 - 1. Air vent and vacuum breaker.
- C. Welding certificates.
- D. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Pipe Welding: Qualify processes and operators according to the following:
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- B. ASME Compliance: Comply with ASME B31.1, "Power Piping" and ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

- C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 DEFINITIONS

- A. HP Systems: High-pressure piping operating at more than 15 psig as required by ASME B31.1.

1.6 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures:
 - 1. Blowdown-Drain Piping: Equal to pressure of the piping system to which it is attached.
 - 2. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
 - 3. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, Type, Grade, and Schedule as indicated in Part 3 piping applications articles.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in Part 3 piping applications articles.
- C. Malleable-Iron Threaded Fittings: ASME B16.3; Classes 150 and 300 as indicated in Part 3 piping applications articles.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 piping applications articles.
- E. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in Part 3 piping applications articles; raised ground face, and bolt holes spot faced.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

2.2 JOINING MATERIALS

A. Gaskets

1. Suitable for chemical and thermal conditions of piping system contents.
2. Anti-Seize compound, if required, shall be Loctite C5-A Copper Based or approved equal.
3. High Pressure Steam Piping: Flexitallic spiral wound gaskets Class 150, ASME B16.20 with 304 SS metal winding strip and Flexicarb flexible graphite filler material; or approved equal.

B. Joint Sealers

1. Use a pipe compound approved for the type of service.
2. All purpose PTFE soft-set thread sealing compound. Jomar Gimmie The White Stuff, Rectorseal No. 5, or approved equal.

C. Flange Bolts and Nuts: Unless required otherwise, conform to ASTM A-354 Grade BD and SAE J-429 Grade 8 for steam and condensate application.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

2.3 STRAINERS

A. Y-Pattern Strainers

1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for strainers 2" and smaller; flanged ends for strainers 2-1/2" and larger.
3. Strainer Screen: Monel metal or stainless-steel, 0.033" dia. for steam and 0.045" for condensate. Free area through the screen shall be at least 2-1/2 times the pipe area in which it is installed.
4. CWP Rating: 250-psig working steam pressure.

B. Basket Strainers

1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for strainers 2" and smaller; flanged ends for strainers 2-1/2" and larger.
3. Strainer Screen: Stainless-steel, 20 mesh strainer, and perforated stainless-steel basket with 50 percent free area.

4. CWP Rating: 250-psig working steam pressure.

2.4 THERMOSTATIC AIR VENTS AND VACUUM BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong International, Inc.
 2. Hoffman Specialty; Division of ITT Industries.
 3. Spirax Sarco, Inc.
- B. Thermostatic Air Vents
 1. Body: Cast iron, bronze or stainless steel.
 2. End Connections: Threaded.
 3. Float, Valve, and Seat: Stainless steel.
 4. Thermostatic Element: Phosphor bronze bellows in a stainless-steel cage.
- C. Vacuum Breakers
 1. Body: Cast iron, bronze or stainless steel.
 2. End Connections: Threaded.
 3. Sealing Ball, Retainer, Spring, and Screen: Stainless steel.
 4. O-ring Seal: EPR.

PART 3 - EXECUTION

3.1 PIPE AND FITTING SCHEDULE

- A. Refer to Drawings for Piping Application Schedule.

3.2 ANCILLARY PIPING APPLICATIONS

- A. Air-Vent Piping
 1. Inlet: Same as service where installed.
 2. Outlet: Type K annealed-temper copper tubing with soldered or flared joints.
- B. Vacuum-Breaker Piping: Outlet, same as service where installed.
- C. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.3 VALVE APPLICATIONS

- A. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment, and at the outlet of steam traps.
- B. Install safety valves on pressure-reducing stations and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

3.4 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Use indicated piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.
- C. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.
- D. Reduce pipe sizes using eccentric reducer fitting installed with level side down.
- E. Install branch connections to mains using tee fittings in main pipe, with the branch connected to top of main pipe, at a 45 degree angle.
- F. Install unions in piping, 2" and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- G. Install flanges in piping, 2-1/2" and larger, at final connections of equipment and elsewhere as indicated.
- H. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install 3/4" nipple and full port ball valve in blowdown connection of strainers 2" and larger. Match size of strainer blowoff connection for strainers smaller than 2".
- I. Strainers are not required for fin tube radiation and convectors.
- J. Strainers ahead of steam pressure regulating and control valves shall be mounted on the side and have blow-off valves.
- K. Install strainers installed ahead of traps on steam main drip legs.
- L. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- M. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.
 - 1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 150 feet.

2. Size drip legs same size as main. In steam mains 6" and larger, drip leg size can be reduced, but to no less than 4".
 3. Install dirt pockets of the drip legs and strainer blow downs with gate valves to remove dirt and scale.
- N. Install manual air vents at all high points in the steam piping and the following locations:
1. On each change of elevation in the steam main.
 2. In each manhole.
 3. At the steam services to each individual building.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube ends. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12 (AWS D10.12M), using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Welded Steel Pipe
 1. All welding shall be done in accordance with the ANSI B-31.1 and the ASME welding code.
 2. Pipe ends on welded pipe lines shall be suitably beveled to permit butt-welding.

3. All welds shall be of sound metal thoroughly fused to the base metal and penetrating to the bottom of the joints.
4. Use welding bends in changing pipe directions. Mitered joints will not be accepted.
5. Welders shall be experienced in the type of work to be done. Any welder, who, in the opinion of the Architect/Engineer or Construction Representative, is not competent to perform the work required, shall be dismissed from the job. At no time shall any welder not approved by the Architect/Engineer be allowed to weld pipe on the project.
6. All welders shall be certified under the procedure of the ANSI B-31.1 and the ASME Welding Code, Section 9, for the thickness and type of high pressure piping and equipment they work on. Tests shall be conducted by Hartford Insurance Co., or equivalent certifying agency. The Engineer shall be sent a copy of the certification of all welders employed on the project.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Size for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install traps and control valves in accessible locations close to connected equipment.
- C. Install vacuum breakers downstream from control valve, close to coil inlet connection.
- D. Install a drip leg at coil outlet.

3.7 FIELD QUALITY CONTROL

- A. Prepare steam and condensate piping according to ASME B31.1, "Power Piping" and/or ASME B31.9, "Building Services Piping," and as follows:
 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush system with clean water. Clean strainers.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
- B. Perform the following tests on steam and condensate piping:
 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure

at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.

3. After hydrostatic test pressure has been applied for at least ten (10) minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.

- C. Prepare written report of testing.

END OF SECTION

**SECTION 23 22 30
STEAM AND STEAM CONDENSATE SPECIALTIES**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following steam specialties indicated by the Contract Documents with supplementary items necessary for their proper installation.
- B. Equipment Included in This Section
 - 1. Steam traps
 - 2. Steam relief valves
 - 3. Steam safety valve discharge elbows
 - 4. Automatic air vents
 - 5. Gauges and gauge connections
 - 6. Thermometer and thermometer wells

1.2 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASTM A105 - Forgings, Carbon Steel, for Piping Components.
 - 2. ASTM A216 - Steel Casings, Carbon, Suitable for Fusion Welding, for High Temperature Service.
 - 3. ASTM A395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 - 4. ASME B31.9 - Building Services Piping.

1.3 SUBMITTALS

- A. Product Data
 - 1. Submit Shop Drawings, wiring diagrams and product data on all steam specialties.

- B. Record Documents
 - 1. Shop Drawing submittal of traps shall contain an itemized list with a tabulation of the load, trap type and trap size.

1.4 QUALITY ASSURANCE

- A. All specialties of the same type shall be provided from the same manufacturer.
- B. Manufacturer's name and pressure rating marked on body of each device.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 STEAM TRAPS

- A. Acceptable Manufacturers
 - 1. Armstrong
 - 2. Mepco
 - 3. Spirax Sarco
 - 4. Spence
 - 5. ITT
- B. Float and Thermostatic Traps
 - 1. ASTM A126, cast iron or semi-steel body and bolted cover for 125 psig WSP; provide access to internal parts without disturbing piping; with bottom drain plug, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly.
 - 2. Float and thermostatic traps for clean steam service shall have Type 316L stainless steel bodies, covers, and all internal components.

2.3 STEAM SYSTEM SAFETY (RELIEF) VALVES

- A. Acceptable Manufacturers
 - 1. Grinnell Fig. No. 1538F
 - 2. Spirax Sarco DPE

3. Spence Engineering DPE

- B. Relief valves 2 inches and smaller shall have brass bodies and arranged for screwed connections. Such relief valves shall be Spence Type 41 or Spirax Sarco 211 Series safety valves for steam. Bushings shall not be used.
- C. Relief valves 2-1/2 inches and larger for all medium and low pressure steam piping systems be arranged for flanged inlet and screwed outlet connections. Such relief valves shall be Spence Type 41 or Spirax Sarco SV Series, ASME Standard Cast Iron Safety Valves.
- D. The pressure at which each relief valve shall open is designated on the Drawings. Specify the pressure at which each relief valve must be set. Each valve shall have a metal tag attached stamped with the valve identification plus the pressure setting. Each valve shall be sized at full steam flow through the PRV and discharge piping must be equal or greater than the steam relief valve outlet size.
- E. Safety relief valve shall comply with ASME Section 1 or 8 as applicable. Provide Certificate of Conformance per ASME standard.
- F. All relief valves are to have cast-iron bodies, with stainless steel trim.

2.4 AUTOMATIC AIR VENTS

- A. Acceptable Manufacturers
 - 1. Spirax Sarco 13W
 - 2. Spence Engineering

2.5 GAUGES AND GAUGE CONNECTIONS

- A. Acceptable Manufacturers
 - 1. Ashcroft No. 1279-R Duragauge
- B. Pressure gauges for interior steam systems shall be 4-1/2 inches with back connection when used on a panel; otherwise they shall have bottom connections. Each gauge shall be provided with Ashcroft carbon steel needle valve and a siphon rated for the steam pressure and temperature. The arrangement of the mechanisms shall conform to pressure ranges and details shown on the Drawings.
- C. The dial graduation shall be 1.5 times the highest working pressure of the steam that the gauge is serving.

2.6 THERMOMETER AND THERMOMETER WELLS

- A. Acceptable Manufacturers
 - 1. Weksler Industrial Thermometers
 - 2. Ashcroft 1279-R

3. Conbraco 20-150

- B. Furnish and install thermometers of not less than 9 inch scale complete with brass separable sockets with extension neck to allow for insulation of piping. These thermometers shall be mercury red reading type in one piece glass tubes extending from top of scale to sensor, and shall be located so that they may be easily read. Field adjustable angle thermometers are acceptable.
- C. Thermometers shall be provided with range of 0 to 220° F at hot water heat exchangers. The sensing element of the thermometer shall be at least one inch into the pipe.
- D. Thermometer test wells shall be 3/4 inch Weksler thermal wells, brass with stem of minimum length to extend beyond the mid-diameter of the pipe, 2-1/2 inch extension neck and brass screw plug. Wells shall be suitable for use of industrial type thermometers.
- E. Indicating thermometers shall be Weksler industrial thermometers having stainless steel separable sockets and scales of the range suitable for steam pressures indicated on flow sheets.

2.7 STEAM AND CONDENSATE METERS

- A. Acceptable Manufacturers
 - 1. EMCO
 - 2. Yokogawa
 - 3. Prior approved equal
- B. Furnish and install differential pressure meter in the steam supply and condensate return system as indicated on Drawings. Meter to be installed to read lbs/hr for steam and GPM for condensate.
- C. Meter shall be constructed of stainless steel with stainless steel internal parts.
 - 1. Maximum Operating Range: 350° F
 - 2. Pressure Range: 0 to 150 psig
 - 3. Maximum pressure drop: 4 psig
 - 4. Output: 12 VDC
 - 5. Maximum Accuracy \pm 0.05 percent over linear flow range
 - 6. Power Available: 12 VDC

2.8 VACUUM BREAKERS

- A. Vacuum breakers shall be used on all modulating or on/off heat exchangers and coils, except in vacuum return systems.

- B. Vacuum breakers shall be of hardened ball check valve design with all working parts manufactured from stainless steel.
- C. Bodies shall be made of brass or stainless steel and shall be suitable for operating conditions of 300 psig saturated steam.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. Install specialties in accordance with manufacturer's instructions.

3.2 INSTALLATION – STEAM TRAPS

- A. Install float and thermostatic traps to drain condensate from unit heaters, converters, heating coils, steam separators, flash tanks, steam jacketed equipment and direct steam injected equipment.
- B. Size steam traps to handle minimum of two times maximum condensate load of apparatus served.
- C. Traps used on steam mains and branches shall be minimum 3/4-inch (20 mm) size.
- D. Install steam traps with union or flanged connections at both ends.
- E. Provide gate valve and strainer at inlet and gate valve at discharge of steam traps.
- F. Provide minimum 10-inch (250 mm) long dirt pocket of same pipe sizes as apparatus return connection between apparatus and steam trap.
- G. Remove thermostatic elements from steam traps or valve out during temporary and trial usage and until system has been operated and dirt pockets cleaned of sediment and scale.
- H. Rate relief valves for pressure upstream of pressure reducing station, for full operating capacity. Set relief at maximum 20 percent above reduced pressure.
- I. Terminate relief valves to outdoors. Provide drip pan elbow with drain connection to nearest floor drain.
- J. When several relief valve vents are connected to a common header, header cross sectional area shall equal sum of individual vent outlet areas.

3.3 INSTALLATION - STEAM SAFETY VALVE DISCHARGE ELBOWS

- A. All vent lines from safety valves shall be provided with safety valve discharge elbows at the point at which such lines rise to an elevation higher than that of the safety valve. The nature and design of the piping systems involved shall effectively drain all condensate from the discharge side of all relief valves. No force shall be exerted on the safety valve by the discharge piping.
- B. Provide temperature sensor mounted in steam safety valve piping in close proximity to steam pressure relief valve. Coordinate with ATC such that an alarm is initiated at the BAS upon a rise in temperature.

3.4 INSTALLATION - STEAM PIPE ANCHORS

- A. All steam lines shall be securely anchored at points designated on the Drawings and/or at such points as may be needed to assure proper control of the expansion and contraction of such systems.

3.5 INSTALLATION - STEAM PIPE GUIDES

- A. All steam piping systems shall be properly guided.

3.6 INSTALLATION - AUTOMATIC AIR VENTS

- A. Provide auto air vents with a pressure rating that is equal to system classification but not less than 125 psig. Provide shut-off valve to facilitate maintenance of air vent.
- B. Locate all air vents and their discharge lines in accessible locations, preferably clustered.

3.7 THERMOMETER AND THERMOMETER WELLS

- A. Thermometers shall in all cases be installed upright or at the proper angle to be read while standing on the floor. The wells for thermometers shall be located in vertical pipes where possible. When installed in horizontal pipes, thermometers shall be installed in the side and not on top of the pipe.
- B. Thermometer wells and thermometers shall be located where noted on the Drawings and where called for in other Specification Sections. Thermometer test wells shall only be installed in a vertical position in horizontal lines and at 45 degrees in vertical lines to hold a fluid in the well.

3.8 VACUUM BREAKERS

- A. Vacuum breakers shall be installed in the supply side between the control valve and equipment.
- B. Install in a vertical position with cap at top.
- C. Mount the vacuum breaker on the highest point of the circuit.
- D. Large coils or equipment may require more than one vacuum breaker to be fitted.

END OF SECTION

**SECTION 23 25 00
HVAC WATER TREATMENT**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all work required to provide and install the HVAC Water Treatment System indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment Included in This Section
 - 1. Chemical-feed equipment and controls.
 - 2. Chemical treatment test equipment.
 - 3. HVAC water-treatment chemicals.
 - 4. Glycol

1.2 PERFORMANCE REQUIREMENTS

- A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.
- B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.
- C. Closed hydronic systems, including hot-water heating, shall have the following water qualities:
 - 1. pH: Maintain a value within 9.0 to 10.5.
 - 2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
 - 3. Boron: Maintain a value within 100 to 200 ppm.
 - 4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
 - 5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
 - 6. TDS: Maintain a maximum value of 10 ppm.
 - 7. Ammonia: Maintain a maximum value of 20 ppm.
 - 8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
 - 9. Microbiological Limits:
 - a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
 - b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.

- c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
- d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
- e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.
- C. Field quality-control test reports.
- D. Other Informational Submittals:
 - 1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
 - 2. Water Analysis: Illustrate water quality available at Project site.

1.4 QUALITY ASSURANCE

- A. HVAC Water-Treatment Service Provider Qualifications: HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section shall have a minimum of five (5) years experience providing commercial or industrial water treatment services.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUAL CHEMICAL-FEED EQUIPMENT

- A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and 3/4" bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.
 - 1. Capacity: Five (5) gal.
 - 2. Minimum Working Pressure: 125 psig
- B. Acceptable Manufacturers:
 - 1. Aqua-Chem
 - 2. Garratt Callahan

3. GE Betz
4. GE Osmonics
5. Hauser Water Systems
6. H-O-H Chemicals
7. Iowa Water Treatment
8. J.L. Wingert Co.
9. Kriss Water Treatment
10. Nalco

2.2 STAINLESS-STEEL PIPES AND FITTINGS

- A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.
- B. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.
- C. Two (2)-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig SWP and 600-psig CWP ratings.
- D. Includes all sample and feed piping required for proper system operation.
- E. Acceptable Manufacturers (unless specified otherwise)
 1. Apollo
 2. Conbraco
 3. Crane
 4. Hammond
 5. HCl
 6. Jenkins
 7. Milwaukee
 8. Nibco
 9. Stockham
 10. Victaulic
 11. Watts

2.3 CHEMICAL TREATMENT TEST EQUIPMENT

- A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.
- B. Sample Cooler
 - 1. Tube: Sample
 - a. Size: NPS 1/4 tubing
 - b. Material: ASTM A 666, Type 316 stainless steel
 - c. Pressure Rating: Minimum 2000 psig
 - d. Temperature Rating: Minimum 850° F
 - 2. Shell: Cooling water
 - a. Material: ASTM A 666, Type 304 stainless steel
 - b. Pressure Rating: Minimum 250 psig
 - c. Temperature Rating: Minimum 450° F
 - 3. Capacities and Characteristics
 - a. Tube: Sample
 - 1) Flow Rate: 0.25 gpm
 - 2) Entering Temperature: 400° F
 - 3) Leaving Temperature: 88° F
 - 4) Pressure Loss: 6.5 psig
 - b. Shell: Cooling water
 - 1) Flow Rate: 3 gpm
 - 2) Entering Temperature: 70° F
 - 3) Pressure Loss: 1.0 psig
- C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.
 - 1. Two (2) - station rack for closed-loop systems.

2.4 CHEMICALS

- A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article. Preliminary analysis would include at a minimum the following:
 - 1. Polymer / sludge conditioner (injected into feed water tank)
 - 2. Oxygen scavenger (injected into feed water tank)
 - 3. Steam line treatment (injected into the main steam header)
- B. Provide all necessary chemicals and procedure required for boil out of all boilers. The mechanical contractor, boiler manufacturer and chemical treatment provider will be responsible for performing the boil out of the boilers.

- C. The entire steam and condensate distribution system will be flushed with steam per Specification Section 230593 Cleaning and Testing. All necessary chemicals needed to flush the existing system shall be provided.

2.5 GLYCOL

A. Solution Requirements

1. Provide a solution of industrial grade inhibited ethylene or propylene glycol-based heat transfer fluid. The concentration shall not be less than 25% glycol by volume, with the balance being good quality water, as defined in below.
2. The fluid must be industrially inhibited, with phosphate-based and copper corrosion inhibitors to passivate the system and buffer the acidic degradation products of glycol. Silicate-based inhibitors, typical of automotive antifreeze, are not acceptable.
3. The fluid must be dyed to facilitate leak detection.
4. The fluid must be easily analyzed for glycol concentration and inhibitor level, and easily re-inhibited using replacement inhibitor readily available from the fluid manufacturer.
5. For a system containing more than 250 gallons of fluid, an annual analysis must be provided free of charge by the fluid manufacturer. The analysis shall report glycol concentration, freeze point temperature, inhibitor level, pH, reserve alkalinity, contaminants such as: chloride, sulfate, nitrite, nitrate, and total hardness. Recommendations on additions of glycol or inhibitors shall also be given as needed.
6. The fluid must pass ASTM D1384 (less than 0.5 mil penetration per year for all system metals).
7. Dilution Water
 - a. The water used to dilute the concentrated inhibited glycol-based heat transfer fluid must be either distilled, deionized, or contain less than 25 ppm each of chloride and sulfate, and less than 50 ppm each of hard water ions (calcium and magnesium as calcium carbonate) with a total hardness not to exceed 100 ppm. If good quality water is unavailable, the manufacturer of the product will provide the heat transfer fluid and water to meet the specifications of the system.

B. Propylene Glycol

1. Mix Propylene glycol with a water to produce a solution by volume as noted for the following systems:
 - a. Heating water system in food grade applications (50%)

C. Acceptable Manufacturers:

1. DOW Chemical Company
2. Prior approved equivalent fluid

PART 3 - EXECUTION

3.1 WATER ANALYSIS

- A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

- A. Install chemical application equipment on concrete bases, level, and plumb provided by Mechanical Contractor. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
- B. Install water testing equipment on wall near water chemical application equipment.
- C. Install interconnecting control wiring for chemical treatment controls and sensors. Control wiring to be installed in metallic conduit per Division 26 requirements.
- D. Mount sensors and injectors in piping circuits.
- E. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, and equipped with the following:
 - 1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
 - 2. Mechanical Contractor to install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
 - 3. Mechanical Contractor to install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
 - 4. Mechanical Contractor to install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 and 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23.
- D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 23 05 23.
- E. Comply with electrical requirements in Division 26 Sections for connecting electrical equipment and installing wiring and conduit.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections
 - 1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
 - 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 - 3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
 - 4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
 - 5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 - 7. Cap any piping subject to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four (4) hours. Leaks and loss in test pressure constitute defects.
 - 8. Repair leaks and defects with new materials and retest piping until no leaks exist.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. At eight (8)- week intervals following one (1) year after Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article.
- F. Comply with ASTM D 3370 and with the following standards:
 - 1. Silica: ASTM D 859.
 - 2. Acidity and Alkalinity: ASTM D 1067.

3. Iron: ASTM D 1068.
4. Water Hardness: ASTM D 1126.

3.5 GLYCOL SYSTEMS

A. System Preparation

1. The system shall be cleaned and flushed prior to the installation of the industrially inhibited glycol-based heat transfer fluid to remove dirt, weld slag, filings, solder flux, oil, etc. A new or mildly corroded system shall be cleaned with a 1% to 2% solution of trisodium phosphate in water, or another approved cleaning solution. This cleaning solution shall be circulated for 8-12 hours and then flushed from the system.
2. An extensively corroded system should be cleaned using a more aggressive commercially available cleaning product as recommended by an industrial cleaning company. All necessary replacements and repairs should be made at this time.
3. The system shall be flushed with clean water and circulated for a minimum of 72 hours, at which time a sample should be taken to verify that the system is free of particulates, mil scale, weld scale, solder flux, rust, metal filings, oil, grease, chlorides, sulfates, silicates, and other foreign matter that could degrade the inhibited glycol-based heat transfer fluid.
4. If the water in the system is not acceptable, as defined in this specification, the water shall be removed from the system, and good quality water obtained to meet the requirements for use in diluting the inhibited glycol-based heat transfer fluid. If the manufacturer is supplying both fluid and water, they may be installed upon removal of the flush water.

B. Fluid Installation

1. The system piping shall be hydrostatically tested to insure that there are no leaks. This may be done using the flush water in the system.
2. The contractor shall furnish and install a water meter to measure the volume of flush water put into the system. The total volume of the system is needed to determine the amount of inhibited heat transfer fluid required to meet the specified glycol concentration for the system. The contractor is responsible for disposal of glycol or water overages.
3. The glycol shall be provided to the job site via a 2-chambered tanker truck. Tanker truck shall be pre-filled with the appropriate amount and type of glycol in one chamber and distilled water in the other chamber. Onsite the trucker shall first pump down the glycol chamber and finish filling the system from the distilled water chamber. This shall minimize the amount of wasted product to just distilled water.
4. The contractor shall provide and install a 2-inch fill connection on the system. The fill connection point shall be within 30' of a point where a truck can be parked for filling. Additional arrangements must be made on projects where the truck is not within 30 - 100' of the connection. The 2-inch fill connection shall be fitted with a Camlock fitting to accept the tanker truck hose. The contractor shall also inform the glycol supplier of the distance in feet between the tanker truck and the location of the special fill connection, so that the truck has an adequate supply of hose. After system filling, this fitting will be

removed and replaced with a pipe cap. The carrier shall be responsible for connecting the hose to the system and all required tanker truck operations.

5. A refractometer as manufactured by Misco Products shall be provided by the contractor and left with the building owner. This refractometer shall be used to measure the freezing point in degrees Fahrenheit of the inhibited glycol/water solution in the system.
6. The contractor shall take a fluid sample with the manufacturer's supplied test kit after the system has been circulating for a minimum of 24 hours. The manufacturer shall provide a thermal fluid analysis report to the engineer in writing. The contractor shall be responsible to complete any changes in the heat transfer solution if it does not meet with these specifications.

C. Identification Materials

1. The contractor will provide a system nameplate permanently encased in clear plastic with, but not limited to, the following information: date, description of heat transfer fluid, manufacturer's name, address, and telephone numbers for normal and emergency contact, percent glycol by volume, freeze point, total system volume in gallons, a copy of or reference to the Material Safety Data Sheet (MSDS), instructions for sampling the fluid, and the address to which the sample is to be sent. Include a notation that the samples will be analyzed free of charge and that recommendations will be provided for adjusting glycol concentration, adding corrosion inhibitors, and for filtering particulates. Include a notation that proper inhibitor monitoring and maintenance must be performed (via annual analysis by the manufacturer) in order to prevent corrosion of the piping system components, degradation of piping system materials, degradation of the glycol, sludge formation in the system, or freezing of the solution.

D. System Design Considerations

1. Water Makeup - Avoid the use of automatic water makeup systems to help prevent undetected dilution of the glycol-based heat transfer fluid and possible contamination of the water system. If a makeup system is desired, the use of a glycol feed tank (containing the same concentration of inhibited glycol-based heat transfer fluid as in the system) along with a low level alarm (to alert the user to a leaking problem) is recommended.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to provide a minimum of two (2) hours training to Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

**SECTION 23 57 00
HEAT EXCHANGERS FOR HVAC**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all work required to provide and install the heat exchangers as indicated by the Contract Documents with supplemental items necessary for proper installation.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Tube-removal space.
 - 2. Structural members to which heat exchangers will be attached.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

PART 2 - PRODUCTS

2.1 SHELL-AND-TUBE HEAT EXCHANGERS

- A. Acceptable Manufacturers
 - 1. Armstrong
 - 2. Bell & Gossett
 - 3. Taco
 - 4. Thrush Company, Inc.
- B. Configuration: U-tube with removable bundle.
- C. Shell Materials: Steel.
- D. Head:
 - 1. Materials: Cast iron.
 - 2. Flanged and bolted to shell.

- E. Tube:
 - 1. Seamless copper tubes.
 - 2. Tube diameter is determined by manufacturer based on service.
- F. Tubesheet Material: Steel.
- G. Baffles: Steel.
- H. Piping Connections:
 - 1. Inlet and outlet fluid connections, threaded drain, and vent connections.
- I. Support Saddles:
 - 1. Fabricated of material similar to shell.
 - 2. Foot mount with provision for anchoring to support.

PART 3 - EXECUTION

3.1 HEAT-EXCHANGER INSTALLATION

- A. Install shell-and-tube heat exchangers on saddle supports supported by structural steel columns. Anchor columns to concrete base.

3.2 CONNECTIONS

- A. Install shutoff valves at heat-exchanger inlet and outlet connections.
- B. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.
- C. Install vacuum breaker at heat-exchanger steam inlet connection.
- D. Install hose end valve to drain shell.

END OF SECTION

**SECTION 23 83 00
RADIANT HEATING SYSTEM**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all work required to provide and install the following Radiant Heating System indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment Included in This Section
 - 1. Piping
 - 2. Distribution manifolds
 - 3. Circuit isolation and balancing valves
 - 4. Controls

1.2 REFERENCES

- A. ASTM F1281 - Standard Specification for Cross-Linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Pressure Pipe.
- B. CAN/CSA-B137.5 - Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications.

1.3 SUBMITTALS

- A. Provide detailed scaled drawings showing tubing layout and installation. Details shall show detailed manifold, inslab piping, and control layouts.
- B. Submit the following:
 - 1. System performance to verify system design as scheduled.
 - 2. Pump data and pump curves.
 - 3. Piping material information.
 - 4. Complete and detailed controls information.

1.4 WARRANTY

- A. In slab piping shall carry a twenty-five (25) year manufacturer's warranty.

PART 2 - PRODUCTS

2.1 RADIANT INFLOOR HEATING SYSTEM

- A. Radiant heating system shall include manifolds containing supply and return outlets with balancing adjustment for each circuit, pumps, expansion tank, control circuit with digital display, three (3)-way mixing valve, automatic air vent, temperature adjustment, 24 VAC control transformers, and mounting bracket with isolation valves.
- B. All components except for the controller and pump shall be provided by a single manufacturer.
- C. Acceptable Manufacturers:
 - 1. Piping, manifold, and valves: Uponor, Rehau, Wirsbo, Watts, Roth, Heat Link or Prior Approved Equal
 - 2. Pumps: Bell & Gossett, Grundfos, Taco, Patterson Pumps or Prior Approved Equal
 - 3. Controls: Rehau, Taco, Tekmar, Roth, Heat Link or Prior Approved Equal

2.2 RADIANT HEATING PIPING (DOWNSTREAM OF MANIFOLDS)

- A. Piping shall be cross-linked polyethylene with aluminum core and oxygen barrier. Pipe shall be a composite PEX-AL-PEX in accordance with ASTM F1281. The PEXALPEX tubing shall be third party certified to CSA B137.10 by the Canadian Standards Association.
- B. Pipe shall have minimum temperature and pressure ratings as follows: 200 psi at 73.4°F; 125 psi at 180°F.
- C. The pipe shall have an oxygen barrier capable of limiting oxygen diffusion below 0.1g/m³/day at 104°F as per DIN 4726. This oxygen barrier shall not be affected by sunlight and must be located within the pipe wall.
- D. Pipe shall have a ULC listed fire rating of five (5) for smoke development rating and five (5) for flame spread rating.
- E. Pipe fittings shall be the same as the pipe manufacturer and intended for infloor heating system use. Fittings shall be brass with double EPDM seals. Fittings shall be attached by pipe manufacturer's crimp ring tool.

2.3 EXTERIOR BURIED PIPING (UPSTREAM OF MANIFOLDS)

- A. Exterior buried piping upstream of manifolds for use in snow melt systems shall be factory insulated with a closed cell foam insulation and jacketed with a watertight corrugated HDPE jacket. Refer to piping application schedule on the drawings for additional information.
- B. Acceptable Manufacturers:
 - 1. Uponor Ecoflex,
 - 2. Rehau Rauvitherm

3. Prior approved equal

- C. Piping shall be cross-linked polyethylene with aluminum core and oxygen barrier. Pipe shall be a composite PEX-AL-PEX in accordance with ASTM F1281. The PEXALPEX tubing shall be third party certified to CSA B137.10 by the Canadian Standards Association.
- D. Pipe shall have minimum temperature and pressure ratings as follows: 200 psi at 73.4°F; 125 psi at 180°F.
- E. The pipe shall have an oxygen barrier capable of limiting oxygen diffusion below 0.1g/m³/day at 104°F as per DIN 4726. This oxygen barrier shall not be affected by sunlight and must be located within the pipe wall.
- F. Pipe shall have a ULC listed fire rating of five (5) for smoke development rating and five (5) for flame spread rating.

2.4 MANIFOLDS AND SYSTEM ASSEMBLIES

- A. Manifolds shall be of brass construction, manufactured of alloys to prevent dezincification, and have integral isolation valves on the supply manifold and circuit balancing valves on the return.
- B. All manifolds shall be supplied with isolation valves between the heat source and the unit.
- C. On a closed loop heating system the system assembly must be complete with a properly sized expansion tank to accommodate the fluid expansion in the piping.
- D. All manifolds shall be supplied with air vent and fill / purge valve□. Provide with temperature and pressure gauges for monitoring.
- E. The system assembly must be factory tested to 50 psi prior to shipment. Installation shall be according to manufacturer's installation guide and wiring diagrams.

2.5 CONTROLS

- A. All hydronic controls must be installed in a steel cabinet (panel) of suitable gauge and size complete with a hinged door and latch.
- B. The control panel must provide constant circulation of the secondary loop water where possible.
- C. Install an inslab temperature sensor to maintain a slab temperature of 78° F (adj.).
- D. Pump and mixing valve shall work to maintain scheduled supply water temperature and slab temperature.
- E. Panel shall have auxiliary contacts to communicate a general system alarm to the DDC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping shall be continuous without any splices in the floor slab. If a fitting must be installed in the concrete slab it must be protected with a sleeve as recommended by the manufacturer and must be approved by the engineer.
- B. Pipe shall be installed in accordance with manufacturer's recommendations and the details on the contract drawings.□
- C. All fittings shall be accessible for maintenance.
- D. When installing the pipe, the manifold connection must be made immediately or capped with tape to seal the pipe from contaminants.
- E. Pipe that passes through expansion joints shall be sleeved a minimum of 10" on both sides of the joint. □Where pipe exits the floor and is subject to mechanical damage a protective sleeve shall be placed around the tube. The sleeve shall extend a minimum of 2" out of the floor.
- F. All circuits will be labeled and marked as Supply and Return, or colored piping dedicated to each service shall be used, e.g. red piping for supply and blue for return.
- G. The contractor will submit a record of actual pipe circuit length for final balancing purposes.
- H. The heating system will be put into full operation after the concrete slab has cured. If it is necessary to operate the heating system to prevent freezing, a maximum supply temperature of 59°F shall be used while the concrete slab is curing. The supply temperature shall be increased by 5°F each day until the maximum operating temperature is reached.
- I. Balance each circuit to maintain even temperature in spaces.
- J. Install the slab temperature sensor in conduit with a pull string such that it can be inspected and/or replaced later without flooring demolition.

3.2 TESTING

- A. The pipe and fittings shall be pressure tested in accordance with applicable codes and industry standards after installation and before the tubing is covered. □The pressure test must be performed a minimum of 24 hours prior to the concrete pour.
- B. If no standard is available perform a test by charging the installed but not yet concealed pipe with water or air. Check the system for leaks. Perform a preliminary pressure test to a maximum pressure of 75 psi. Stabilize the pressure over 30 minutes. Test the system for a minimum of one (1) hour. During this time the pressure shall not fall more than 2 psi. No leakage should be detected. Reduce the pressure to 40 psi and maintain the pressure test throughout the concrete pour and a minimum of 24 hours after the concrete pour.

END OF SECTION

**SECTION 26 05 00
COMMON WORK RESULTS**

PART 1 - GENERAL

1.1 SCOPE

- A. The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections.
- B. Overview of Work
 - 1. Demolition/Relocation/Modification
 - 2. Power Distribution
 - 3. Branch Power
 - 4. Equipment Connections
 - 5. Lighting and Lighting Controls
- C. In these documents, "Contractor" refers to the Electrical Contractor and all their subcontractors, unless listed otherwise. The division of Work with the electrical scope is the responsibility of the General Contractor.
- D. The Contractor is responsible for providing and installing fully functional systems.
- E. If the Work is shown on the drawings or noted in the specifications, it shall be included by the Contractor.
- F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.
- G. Drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every conduit in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.
- H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.
- I. All sizes as given are minimum except as noted.
- J. All materials shall be new (unless noted or stated otherwise) and free of defect.

- K. All work shall be subject to the Architect's, Engineer's, and Owner's observations from the commencement of work until the acceptance of the completed work.

1.2 RELATED WORK

- A. Applicable provisions of Division 0 and Division 1 govern work under this Section.

1.3 REFERENCES

- A. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.

- B. Codes

- 1. International Building Code
- 2. International Fire Protection Code
- 3. International Energy Conservation Code
- 4. NFPA – National Fire Protection Association
 - a. NFPA 70 (National Electric Code)
 - b. NFPA 72 (National Fire Alarm and Signaling Code)
 - c. NFPA 101 (Life Safety Code)

- C. Standards

- 1. FGI Guidelines for Design and Construction of Health Care Facilities
- 2. ANSI
- 3. FAA Published Standards

- D. Governing Bodies

- 1. Owner's Insurance Company
- 2. State Fire Marshall
- 3. AHJ – Authority Having Jurisdiction
- 4. UL - Underwriters Laboratories

1.4 SUBMITTALS

- A. The review of Shop Drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the Plans and Specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means,

methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.

- B. Refer to individual technical Specification sections for specific submittal requirements.
- C. Submission of Shop Drawings electronically in .PDF format is required.
- D. If hard copies of shop drawings are required for this project, coordinate the quantity with the Architect and General Contractor. Provide one (1) copy for the Engineer's records.
- E. The Engineer will review one (1) resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.
- F. Contractor may request electronic files from the Engineer if needed to complete their Shop Drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.
- G. All submittals for equipment and materials shall be reviewed and approved by the Engineer prior to the fabrication or release by the contractor. This includes the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.
- H. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.
- I. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

1.5 ELECTRONIC DOCUMENT RELEASE

- A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:
 - 1. PDF
 - a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.
 - 2. REVIT
 - a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
 - b. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
 - c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required.
 - d. Submittal of the document release form fee will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

- A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.
- B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:
 - 1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.
 - 2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.
 - 3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.
- C. Approval
 - 1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.
 - 2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repared at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 QUALITY ASSURANCE

- A. Warranty
 - 1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.
 - 2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion
- B. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the electrical and technology systems. Not all conduits, junction boxes, accessories, etc. are shown on Plan. If items are required to make a system fully operational but not shown on Plan or in these Specifications, they shall be included by the Contractor.

- C. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.
- D. It is the contractor's responsibility to determine all utility routing prior to purchase and installation of material.
- E. For remodel or addition projects, the contractor shall visit and survey the site prior to submitting a bid. The contractor shall visit the site to understand the complexity of utility routing, phasing, staging, and all general installation. Submitting a bid means the contractor acknowledges the complexities of the project and has made provisions for overcoming these complexities in their bid.
- F. The Contractor shall report any discrepancies between these documents and site conditions immediately to the Engineer prior to submitting a bid or starting work. Submittal of a bid indicates that the contractor and the contractor's subcontractors have carefully and thoroughly reviewed the Drawings, Specifications, and other construction documents and have found them complete and free from ambiguities and sufficient for the purposes intended.
- G. Install all equipment per the manufacturer's requirements / recommendations.
- H. No equipment provided or installed shall contain mercury.
- I. All equipment shall be UL listed where applicable.

1.8 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Engineer and the Owner. Any outage must be scheduled when the interruption causes the least interference with normal work schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours unless specifically noted in the Specifications or in the bidding requirements.
- B. This Contractor shall restore any electrical services interrupted as a result of a lack of coordination to proper operation as soon as possible.
- C. Contractor shall notify Owner of any utility service shutdown forty-eight (48) hours in advance.

1.9 REGULATORY AND UTILITY REQUIREMENTS

- A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.
- B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.

1.10 PROTECTION OF FINISHED SURFACES

- A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.11 SEALING AND FIRESTOPPING

- A. Sealing and firestopping of sleeves/openings between conduits, cable trays, wireways, troughs, etc. and the structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.12 WORK BY OWNER AND/OR OWNER AGENCY

- A. Asbestos abatement and PCB equipment (other than light fixture ballasts) removal and disposal, if required, will be by the Owner under separate contract.

1.13 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.14 DELIVERY, STORAGE, AND HANDLING

- A. All equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
- B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to motor controllers, enclosures, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.
- C. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
- D. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
- E. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner's satisfaction.

1.15 DIVISION OF WORK AND COORDINATION

- A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment provided by others shall be the responsibility of the manufacturer or the contractor responsible for providing and installing the equipment.

- B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.
- C. Utilities routed within the building shall be installed in an orderly manner. All work will be coordinated with other disciplines prior to installation. The following list ranks the priority of the utilities to be installed:
 - 1. Light fixtures
 - 2. Gravity piping
 - 3. Cable tray
 - 4. All other piping
 - 5. Electrical conduits
- D. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- E. Arrange for conduit and raceway spaces, chases, slots, and openings in building structure during progress of construction, to allow for electrical installations.
- F. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

1.16 SALVAGE MATERIALS

- A. No materials removed from this project shall be reused. All materials removed shall become the property of, and shall be disposed of by, the Contractor except for items the Owner has designated they will keep.

1.17 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.
- B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:
 - 1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - 2. A control sequence describing start-up, operation, and shutdown.
 - 3. Description of the function of each principal item of equipment.
 - 4. Installation instructions.
 - 5. Safety precautions for operation and maintenance.

6. Diagrams and illustrations.
7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
8. Performance data.
9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.18 RECORD DRAWINGS

- A. The Contractor shall maintain at least one (1) copy of the Specifications and Drawings on the job site at all times.
- B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.
- C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
- D. At completion of the project, the Contractor shall submit the marked-up record drawings to the General Contractor prior to final payment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.

2.2 IDENTIFICATION

- A. See Electrical Section 260553 – Identification.

2.3 SEALING AND FIRESTOPPING

- A. Fire and/or Smoke Rated Penetrations
 1. Manufacturers
 - a. 3M, STI/SpecSeal, Tremco, Hilti or approved equal.
 2. All firestopping systems shall be by the same manufacturer.

3. Submittals

- a. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

4. Product

- a. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.
- b. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.
- c. Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

B. Non-Rated Penetrations

1. Conduit and Cable Tray Penetrations

- a. At conduit penetrations of exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

- A. Refer to Division 1, General Requirements, Cutting and Patching.

3.2 EQUIPMENT ACCESS

- A. Install all conduit, raceways, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.3 COORDINATION

- A. The Contractor shall cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc.

- C. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing Contractor's expense.
- D. Coordinate clearances in front of and above electrical distribution equipment with other trades to avoid interference issues. Maintain clearances as defined in the National Electrical Code. Pipes, ducts, etc. shall not be installed above electrical distribution equipment.

3.4 SEALING AND FIRESTOPPING

- A. Fire and/or Smoke Penetrations
 - 1. Install approved product in accordance with the manufacturer's instructions where a raceway (i.e. cable tray, bus, cable bus, conduit, wireway, trough, etc.) penetrates a fire rated surface.
- B. Non-Rated Surfaces
 - 1. When the opening is through an exterior wall or roof the opening must be sealed using an approved type of material.

3.5 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, daily, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.6 TESTING

- A. Test Conditions
 - 1. Place circuits and equipment into service under normal conditions, collectively and separately, as may be necessary to determine satisfactory operation. Perform specified tests in the presence of the Owner's representative(s). Furnish all instruments, wiring, equipment and personnel required for conducting tests. Demonstrate that the equipment operates in accordance with requirements of the Contract Documents.

3.7 OWNER TRAINING

- A. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period for the duration noted in the technical Specifications.

3.8 PROJECT CLOSEOUT REQUIREMENTS

- A. Final project closeout tasks
 - 1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.
 - 2. All equipment labeled per specifications.

3. All equipment cleaned and ready for use. Install new fuses in all equipment with fuses; do not use Owner's spare fuses.

B. Contractor requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.
2. Operation and Maintenance (O & M) Manuals shall include the following:
 - a. Contractor contact for warranty work
 - b. Approved shop drawings, incorporating all review comments
 - c. Warranty copies
 - d. Equipment start-up reports
 - e. Operation and maintenance instructions

- C. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)



Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- | | |
|--|--|
| <input type="checkbox"/> AutoCAD DWG Files (Version _____) | <input type="checkbox"/> Adobe PDF Files |
| <input type="checkbox"/> REVIT Files (Version _____) | <input type="checkbox"/> Other |

Requesting Party:

Name:	Address 1:
Company:	Address 2:
Signature:	Email Address:
Date:	Phone #:

Bluestone Use:

Form Sent By: _____ Date: _____

Bluestone Project #: _____

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub consultants that may arise out of or in connection with your use of the electronic files. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files. These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

5518 NW 88th Street | Johnston, IA 50131 | P 515.727.0700 | F 515.727.0777 | www.bluestonemep.com

Engineer's Review and Action

- Substitution Approved
- Substitution Approved As Noted
- Substitution Rejected
- Substitution Request Received Too Late

Signed by:

Date

Supporting Data Attached:

- Drawings
- Product Data
- Samples
- Tests
- Reports
- Other _____

SUBSTITUTION REQUEST FORM (AFTER BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

INSTALLER	PHONE NO.
_____	_____

History: New Product 2-5 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days

Savings to Owner for accepting substitution: \$ _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:

Signature

Firm

Telephone

Email

Date

Engineer's Review and Action

- Substitution Approved
- Substitution Approved As Noted
- Substitution Rejected
- Substitution Request Received Too Late

Signed by:

Date

Supporting Data Attached:

- Drawings
- Product Data
- Samples
- Tests
- Reports
- Other _____

**SECTION 26 05 02
ELECTRICAL DEMOLITION FOR REMODELING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide the following demolition indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and/or existing record documents. It is the responsibility of the Contractor to visit the site prior to bidding and include any necessary demolition, or relocation of items required to complete the work. Any work not included shall be clarified with the submittal of the Contractor's bid. Report discrepancies to the Architect and Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Disconnect electrical systems in structures, floors, walls, and ceilings scheduled for removal.
- B. 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. In particular, all security and safety systems must be maintained in operation at all times as required by the Owner. This includes security and safety lighting.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work to meet all requirements of these Specifications.
- B. If certain raceways and boxes are abandoned but not scheduled for removal, those items must be shown on the "As Built Drawings".
- C. Remove, relocate, and extend existing installations to accommodate new construction.
- D. Remove abandoned wiring to source of supply.
- E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards:
 - 1. Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required for furnishing and installing required wiring and cabling systems including pulling, terminating and splicing.

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section
- B. Section 260533 Raceway and Boxes
- C. Section 260553 Identification

1.3 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.
- B. All conductors shall be copper.
- C. Insulation shall have a 600 volt rating.
- D. Conductors may be solid or stranded.
- E. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

2.2 BUILDING WIRE

- A. Acceptable Manufacturers: American Insulated Wire Corp., BICC General Cable Industries Inc., Cerro Wire & Cable Co. Inc., Pirelli Cable Corp., Rome Cable Corp., or Southwire Co.
- B. Single Conductor Insulated Wire.
 - 1. THHN, THW, THW-2, THWN, THWN-2, XHH, XHHW, or XHHW-2: Wiring in dry or damp locations (except where special type insulation is required).
 - 2. THWN, THWN-2, XHHW, XHHW-2, USE, or USE-2: Wiring in wet locations
 - 3. THHN, THWN or THWN-2: Wiring installed in existing raceway systems (except where special type insulation is required).

2.3 WIRING CONNECTORS

- A. Split Bolt Connectors: Not acceptable unless noted otherwise.
- B. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
- C. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
- D. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.
- E. Mechanical Connectors:
 - 1. Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
- F. Insulated Connector Blocks:
 - 1. Conductor count, size, and entry configuration to match application.
 - 2. UV rated.
 - 3. Dual rated for use with copper or aluminum conductors.
 - 4. 600 volt, 90° C termination rating.
 - 5. Caps for sealing wrench access port.
- G. Compression (crimp) Connectors:
 - 1. Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.

2.4 WIRE MANAGEMENT

- A. Cable Clamps and Clips, Cable Ties, Spiral Wraps, etc: Catamount/T&B Corp., or Ideal Industries Inc.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, and as required to ensure that products serve the intended functions.
- B. Cables shall be selected on the basis of their purpose and UL listing.
 - 1. Generally, use Types THWN, XHHW and THNN in building interiors and other dry locations.
 - 2. Outdoors and in underground raceways, use Type THWN or other conductor type rated for wet location as required by NEC 300.5(B).
- C. All wire and cable shall be installed in conduit.
- D. Do not use wire smaller than 12 AWG for power and lighting circuits. Minimum size for control circuits shall be 14 AWG copper stranded.
- E. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity.
- F. As a minimum use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- G. Splice only in junction or outlet boxes.
- H. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary.
- B. Completely and thoroughly swab raceway system before installing conductors.
- C. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway.

3.3 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.

- C. All splices shall be so made that they have an electrical resistance not in excess of two feet of the conductor.
- D. Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.
- E. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

3.4 WIRE COLOR

- A. Use colored wire, colors to be as indicated below.
 - 1. Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase.
 - 2. Ground Conductors: Green

3.5 WIRE MANAGEMENT

- A. Use wire management products to bundle, route, and support wiring in junction boxes, pullboxes, wireways, gutters, channels, and other locations where wiring is accessible.

3.6 BRANCH CIRCUITS

- A. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

END OF SECTION

**SECTION 26 05 23
CONTROL CABLES**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the required remote control and signal cabling indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 260533 Raceway and Boxes.
- C. Section 260553 Identification.
- D. NFPA 70 National Electrical Code.

1.3 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All wire shall be new and shall be less than one year old out of manufacturer's stock.
- B. All conductors shall be copper. Insulation shall have a 600 volt rating.
- C. All conductors must be suitable for the application intended. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:
 - 1. All conductors terminated with crimp type devices must be stranded.
 - 2. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

2.2 REMOTE CONTROL AND SIGNAL CABLE

- A. All other systems cabling shall meet the requirements of NEC Article 725 and the following:
 - 1. Control Cable for Class 1 Remote Control and Signal Circuits: 600 volt insulation, individual conductors twisted together, and covered with an overall PVC jacket.
 - a. Cable shall be Listed, temperature rated, and plenum or non-plenum rated for the application as required in the National Electrical Code.
 - 2. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits shall be constructed, Listed, temperature rated, and plenum or non-plenum rated for the application as required in the NEC Article 725.

2.3 WIRING CONNECTORS

- A. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
- B. All wire connectors used in exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Low voltage control and signal cables shall be installed in conduit. Splice only in junction boxes. Neatly train and lace wiring inside boxes, and equipment.
- B. Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts, all sizes subject to NEC 725 requirements.
- C. Identify wire per section 260553.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor in the same raceway.

3.3 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes. All splices shall be so made that they have an electrical resistance not in excess of two (2) feet of the conductor. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.
- B. Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.
- C. Thoroughly clean wires before installing lugs and connectors.

END OF SECTION

**SECTION 26 05 29
HANGERS AND SUPPORTS**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following hangers and supports indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment included in this Section
 - 1. Conduit and equipment supports
 - 2. Straps
 - 3. Clamps
 - 4. Steel channel, etc.
 - 5. Fastening hardware for supporting electrical work.

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section.

1.3 QUALITY ASSURANCE

- A. Support systems shall be adequate for the weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 ANCHORING DEVICES

- A. Sleeve Anchors
 - 1. Molly/Emhart's Parasleeve Series
 - 2. Phillips' Red Head Dynabolt Series
 - 3. Ramset's Dynabolt Series
- B. Wedge Anchors
 - 1. Hilti's Kwik Bolt Series
 - 2. Molly/Emhart's Parabolt Series
 - 3. Phillips' Red Head Trubolt

- 4. Ramset's Trubolt Series
- C. Concrete Screw Anchors
 - 1. Phillips' Red Head Tapcon
- D. Non-Drilling Anchors
 - 1. Hilti's Drop-In Anchor Series
 - 2. Phillips' Red Head Multi-Set II Series
 - 3. Ramset's Dynaset Series
- E. Stud Anchors
 - 1. Phillips' Red Head JS Series

2.2 MISCELLANEOUS FASTENERS

- A. Except where shown otherwise on the Drawings, furnish fastener type, size, and grade required for proper installation of the Work. Select from the following:
 - 1. Cadmium or Zinc Coated Fasteners: Dry locations.
 - 2. Galvanized Fasteners: For exterior use, or for items anchored to exterior walls, except where stainless steel is indicated.

2.3 HANGER RODS

- A. Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with nuts as required to position and lock rod in place. Unless galvanized or cadmium plated, provide a shop coat of red lead or zinc chromate primer paint.
- B. Minimum sized threaded rod for supports shall be 3/8" for trapezes and single conduits 1-1/4" and larger, and 1/4" for single conduits 1" and smaller.

2.4 CHANNEL SUPPORT SYSTEM

- A. Channel Material: 12 gauge steel.
- B. Finishes
 - 1. Phosphate and baked green enamel/epoxy.
 - 2. Pre-galvanized.
 - 3. Electro-galvanized.
 - 4. Hot dipped galvanized.
- C. Fittings: Same material and finish as channel.

D. UL Listed Systems

1. B-Line Systems Inc.'s B-22 (1-5/8 x 1-5/8 inches), B-12 (1-5/8 x 2-7/16 inches), B-11 (1-5/8 x 3-1/4 inches).
2. Grinnell Corp.'s Allied Power-Strut PS 200 (1-5/8 x 1-5/8 inches), PS 150 (1-5/8 x 2-7/16 inches), PS 100 (1-5/8 x 3-1/4 inches).
3. Kindorf's B-900 (1-1/2 x 1-1/2 inches), B-901 (1-1/2 x 1-7/8 inches), B-902 (1-1/2 x 3 inches).
4. Unistrut Corp.'s P-3000 (1-3/8 x 1-5/8 inches), P-5500 (1-5/8 x 2-7/16 inches), P-5000 (1-5/8 x 3-1/4 inches).
5. Versabar Corp.'s VA-1 (1-5/8 x 1-5/8 inches), VA-3 (1-5/8 x 2-1/2 inches).

2.5 MISCELLANEOUS FITTINGS

A. Side Beam Brackets

1. B-Line Systems Inc.'s B102, B103, B371-2
2. Kindorf's B-915
3. Versabar Corp.'s VF-2305, VF-2507

B. Pipe Straps (Heavy Duty Type):

1. Two (2) Hole Steel Conduit Straps:
 - a. B-Line Systems Inc.'s B-2100 Series
 - b. Kindorf's C-144 Series
 - c. Unistrut Corp.'s P-2558 Series
2. One (1) Hole Malleable Iron Clamps:
 - a. Kindorf's HS-400 Series
 - b. OZ/ Gedney Co.'s 14-G Series, 15-G Series (EMT)

C. Deck Clamps: Caddy/Erico Products Inc.

D. Supporting Fasteners (Metal Stud Construction): Metal stud supports, clips and accessories as produced by Caddy/Erico Products Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Where specific fasteners are not specified or indicated for securing items to in-place construction, provide appropriate type, size, and number of fasteners for a secure, rigid installation.

- B. Install anchoring devices and other fasteners in accordance with manufacturer's printed instructions.
- C. Make attachments to structural steel wherever possible.

3.2 FASTENER SCHEDULE

- A. Material
 - 1. Use cadmium or zinc coated anchors and fasteners in dry locations.
 - 2. Use hot dipped galvanized or stainless steel anchors and fasteners in damp and wet locations.
- B. Types and Use: Unless otherwise specified or indicated use:
 - 1. Cast-in-place concrete inserts in fresh concrete construction for direct pull-out loads such as shelf angles or fabricated metal items and supports attached to concrete slab ceilings.
 - 2. Anchoring devices to fasten items to solid masonry and concrete when the anchor is not subjected to pull out loads, or vibration in shear loads.
 - 3. Toggle bolts to fasten items to hollow masonry and stud partitions.
 - 4. Metallic fasteners installed with electrically operated or powder driven tools for approved applications, except:
 - a. Do not use powder driven drive pins or expansion nails.
 - b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
 - c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
 - d. Do not use powder driven fasteners in precast concrete
 - 5. Metallic hammer set anchors may be used in wall and ceiling applications. Maximum conduit size supported with hammer set anchors is 1 Inch.

3.3 ATTACHMENT SCHEDULE

- A. General: Make attachments to structural steel or steel bar joists wherever possible. Provide intermediate structural steel members where required by support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.
 - 1. Make attachments to steel bar joists at panel points of joists.
 - 2. Do not drill holes in main structural steel members.
 - 3. Use "C" beam clamps for attachment to steel beams.
- B. Where it is not possible to make attachments to structural steel or steel bar joists, use the following methods of attachment to suit type of construction unless otherwise specified or indicated on the drawings.

1. Attachment to Steel Roof Decking (No Concrete Fill):
 - a. Decking With Hanger Tabs: Use deck clamps.
 - b. Decking Without Hanger Tabs:
 - 1) After Roofing Has Been Applied: Use welding studs, or self-drilling/tapping fasteners. Exercise extreme care when installing fasteners to avoid damage to roofing.
2. Attachment to Concrete Filled Steel Decks (Total thickness, 2-1/2 inches or more):
 - a. After Fill Has Been Placed: Use welded studs. Do not support a load in excess of 250 lbs from a single welded stud.
3. Attachment to Cast-In-Place Concrete:
 - a. Fresh Concrete: Use cast-in-place concrete inserts.
 - b. Existing Concrete: Use anchoring devices.
4. Attachment to Metal Stud Construction: Use supporting fasteners manufactured specifically for the attachment of raceways and boxes to metal stud construction.
 - a. Support and attach outlet boxes so that they cannot torque/twist by using one of the following:
 - 1) Bar hanger assembly.
 - 2) Box hanger with far side support.
 - 3) Between stud mounting bracket.

3.4 CONDUIT SUPPORT SCHEDULE

- A. Provide number of supports as required by National Electrical Code.
- B. Use pipe straps and specified method of attachment where conduit is installed proximate to surface of wood or masonry construction.
 1. Use hangers secured to surface with specified method of attachment where conduit is suspended from the surface.
- C. Use "C" beam clamps and hangers where conduit is supported from steel beams.
- D. Use deck clamps and hangers where conduit is supported from steel decking having hanger tabs.
 1. Where conduit is supported from steel decking that does not have hanger tabs, use clamps and hangers secured to decking, utilizing specified method of attachment.
- E. Use channel support system supported from structural steel for multiple parallel conduit runs.
- F. Where conduits are installed above ceiling, do not rest conduit directly on runner bars, T-Bars, etc.
 1. Conduit Sizes 2-1/2 Inches and Smaller: Support conduit from ceiling supports or from construction above ceiling.
 2. Conduit Sizes Over 2-1/2 Inches: Support conduit from concrete deck, beams, joists, or trusses above ceiling.

3.5 LIGHTING FIXTURE SUPPORT SCHEDULE

- A. Number of Supports for Wall Mounted Lighting Fixtures: Provide at least the following number of supports. Provide additional supports when recommended by fixture manufacturer, or shown on the drawings.
 - 1. Commercial and Industrial LED Fixtures:
 - a. An adequately supported outlet box may be utilized as one (1) point of support for fixtures weighing less than 50 pounds.

3.6 CHANNEL SUPPORT SYSTEM SCHEDULE

- A. Use channel support system where specified or indicated on the drawings.
- B. Channel supports may be used, as approved, to accommodate mounting of equipment.
- C. Material and Finish:
 - 1. Dry Locations: Use 12 gauge steel channel support system having any one of the specified finishes.
 - 2. Damp Locations: Use 12 gauge steel channel support system having any one of the specified finishes except green epoxy/enamel.
 - 3. Wet locations: Use 12 gauge steel channel support system having hot dipped galvanized, or PVC finish.

END OF SECTION

**SECTION 26 05 33
RACEWAYS AND BOXES**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the following conduits, surface raceways, multi-outlet assemblies, auxiliary gutters, wall duct, and boxes for electrical systems including wall and ceiling outlet boxes, floor boxes, and junction boxes.

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this section.
 - 1. Section 260529 – Hangers and Supports.
 - 2. Section 262726 – Wiring Devices.
 - 3. Section 262702 – Equipment Wiring.

PART 2 - PRODUCTS

2.1 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

- A. Conduit: Galvanized steel, threaded.
- B. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. Conduit: Steel, galvanized tubing.
- B. Fittings:
 - 1. All steel, set screw, concrete tight. No push-on or indenter types permitted.
 - 2. Raintight Fittings:
 - a. All steel construction with zinc electroplate finish provides for durable corrosion resistance
 - b. Distinct color to provide quick raintight identification
 - c. Integral gasketed compression ring secures and seals for reliable installation
 - d. Gasket on male threads of box connector seals installation for raintight connection between the box and the connector
- C. Conduit Bodies: All steel threaded conduit bodies.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, sunlight-resistant jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

2.4 CONDUIT SUPPORTS

- A. See Section 260529.

2.5 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: galvanized steel, with stamped knockouts.
- B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8 inch male fixture studs where required.
- C. Concrete Ceiling Boxes: Concrete type.
- D. Cast Boxes: Cast ferroalloy, or aluminum type deep type, gasketed cover, threaded hubs.

2.6 PULL AND JUNCTION BOXES

- A. Pull boxes and junction boxes shall be minimum 4 inch square by 2 1/8th inches deep for use with 1 inch conduit and smaller. On conduit systems using 1 1/4 inch conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4 11/16 inch square.
- B. Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. The use of box extension rings is discouraged. If they must be used only one ring per box is allowed and wiring must extend a minimum of 6" beyond the front edge of the extension ring.
- E. Box extensions and adjacent boxes within 48" of each other are not allowed for the purpose of creating more wire capacity.
- F. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.
- G. Wireways shall not be used in lieu of junction boxes.

2.7 GENERAL

- A. All steel fittings and conduit bodies shall be galvanized.
- B. No cast metal or split-gland type fittings permitted.
- C. Mogul-type condulets larger than two (2) inch not permitted except as approved or detailed.

- D. All conduit covers must be fastened to the conduit body with screws and be of the same manufacture.
- E. Wireways, gutters and c-condulets shall not be used in lieu of pull boxes and condulets.
- F. All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. EMT is permitted to be used in sizes 4" and smaller for power and telecommunication systems. See CONDUIT INSTALLATION SCHEDULE below for other limitations for EMT and other types of conduit.
- B. Size power conductor raceways for conductor type installed. Conduit size shall be 1/2 inch minimum except all homerun conduits shall be 3/4", or as specified elsewhere. Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three (3) current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.
- C. Arrange conduit to maintain headroom and present a neat appearance.
- D. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- E. Maintain minimum six (6) inch clearance between conduit and piping. Maintain twelve (12) inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- F. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay-in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.
- G. Group conduit in parallel runs where practical and use conduit rack (lay-in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- H. Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.
- I. Support and fasten metal conduit at a maximum of eight (8) feet on center.
- J. Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.
- K. In general, all conduits shall be concealed except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical, electrical or utility rooms that are not occupied spaces.
- L. Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

- M. For indoor conduits, no continuous conduit run shall exceed 100 feet without a junction box.
- N. All conduits installed in exposed areas shall be installed with a box offset before entering box.

3.2 CONDUIT INSTALLATION

- A. Ground and bond conduit under provisions of Section 260526.
- B. Cut conduit square; de-burr cut ends.
- C. Conduit shall not be fastened to the corrugated metal roof deck. Maintain a minimum six (6) inch separation from the roof deck to conduits.
- D. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- E. Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.
- F. All conduit terminations (except for terminations into conduit bodies) shall use conduit hubs, or connectors with one (1) locknut, or shall use double locknuts (one (1) each side of box wall) and insulated bushing. Provide bushings for the ends of all conduit not terminated in box walls. Refer to Section 260526 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.
- G. Install no more than the equivalent of four (4) 90 degree bends between boxes.
- H. Use hydraulic one (1)-shot conduit bender or factory elbows for bends in conduit larger than two (2) inch size unless sweep elbows are required.
- I. Conduit shall be bent according to manufacturers' recommendations.
- J. Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.
- K. Provide 1/8 inch nylon pull string in empty conduit, except sleeves and nipples.
- L. Install expansion-deflection joints where conduit crosses building expansion joints. Note: expansion-deflection joints are not required where conduit crosses building control joints if the control joint does not act as an expansion joint.
- M. Where conduit passes between areas of differing temperatures such as into or out of unheated and heated spaces, buildings, etc., provide Listed conduit seals to prevent the passage of moisture and water vapor through the conduit.
- N. Route conduit through roof openings for piping and ductwork where possible.

3.3 CONDUIT INSTALLATION SCHEDULE

- A. Conduit other than that specified below for specific applications shall not be used.
- B. Exposed Outdoor Locations: IMC conduit.
- C. Wet Interior Locations: Electrical metallic tubing with raintight fittings.

- D. Concealed Dry Interior Locations: Electrical metallic tubing.
- E. Exposed Dry Interior Locations: Electrical metallic tubing.
- F. Motor and equipment connections: Flexible PVC coated metal conduit (all locations). Minimum length shall be one foot, maximum length shall be three feet. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
- G. Light fixtures: Direct box or conduit connection for surface mounted and recessed fixtures.

3.4 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
- D. Boxes shall not be fastened to the metal roof deck. Maintain a minimum six (6) inch separation from the roof deck to boxes.
- E. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.
- F. In case of any question over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.
- G. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.
- H. Locate and install boxes to allow access to them.
- I. Locate and install to maintain headroom and to present a neat appearance.

3.5 OUTLET BOX INSTALLATION

- A. Provide knockout closures for unused openings.
- B. Support boxes independently of conduit except for cast boxes that are connected to two (2) rigid metal conduits, both supported within twelve (12) inches of box.
- C. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.
- D. Provide cast ferroalloy or aluminum outlet boxes in exterior and wet locations.
- E. Surface wall outlets shall be four (4) inch square with raised covers for one (1) and two (2) gang requirements. For three (3) gang or larger requirements, use gang boxes with non-overlapping covers.

3.6 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings, in unfinished areas or furnish and install access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.
- B. Support pull and junction boxes independent of conduit.

END OF SECTION

**SECTION 26 05 53
IDENTIFICATION**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the labeling of power and control cabling.

1.2 REFERENCES

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Section 260519 – Low Voltage Electrical Power Conductors and Cables
- C. Section 260523 – Control Cables

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED. Exception: Back side of device plates and junction boxes may use handwritten, legible labeling on box covers, unless specifically prohibited by other specification sections.
- B. Cable label size shall be appropriate for the conductor or cable size(s), outlet faceplate layout and patch panel design. All labels shall be self-laminating, white/transparent vinyl and be wrapped around the cable or sheath. Labels for power conductors (600V and lower) shall be cloth-type. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.
- C. Nameplates: Engraved three-layer laminated plastic, white letters on a black background. Emergency system (Level 1 and Level 2) shall use white letters on red background.
- D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.
- E. Adhesive type labels not permitted except for phase and wire identification. Machine generated adhesive labels shall be permitted for device plates and 4-11/16" and smaller junction boxes.

PART 3 - EXECUTION

3.1 GENERAL

- A. Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent.

- B. Install all labels firmly as recommended by the label manufacturer.
- C. Labels shall be installed plumb and neatly on all equipment.
- D. Install nameplates parallel to equipment lines.
- E. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.
- F. Embossed tape will not be permitted for any application.

3.2 JUNCTION AND PULLBOX IDENTIFICATION

- A. Provide circuit numbers, and source panel designations for power wiring. Other system shall be identified as shown on details or approved shop drawings. Temperature control shall identify the source.

3.3 POWER AND CONTROL WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.
- B. All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated including wiring used for temporary purposes.

3.4 WIRING DEVICE IDENTIFICATION

- A. Wall switches, line voltage wall dimmers, motor switches, receptacles (interior, exterior, floor boxes, etc.), photocells and time clocks shall be identified with circuit numbers and source. Labeling shall be permanent and machine generated. Label shall have 1/4" black text on a clear label. Label shall be installed at consistent location on the face of the device cover plate.

3.5 NAMEPLATE ENGRAVING

- A. Provide nameplates of minimum letter height as scheduled below.
- B. Motor Starters, and VFD's: 1/2 inch; identify source and load served.
- C. Junction boxes: 1 inch; identify system source(s) and load(s) served. Junction boxes may be neatly identified using a permanent marker.

3.6 PANELBOARD DIRECTORIES

- A. Typed directories for panels must be covered with clear plastic, have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

END OF SECTION

SECTION 26 08 00
COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide the commissioning of electrical systems indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Commissioning of this project shall meet the current adopted version of the International Energy Conservation Code.

1.2 QUALITY ASSURANCE

- A. Installer and Manufacturer Qualifications
 - 1. Installer shall have an established working relationship with Control System Manufacturer.
 - 2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.
- B. Commissioning Agent Qualifications
 - 1. The testing commissioning agent will need to have a certification that has been accredited by the American National Standards Institute (ANSI).
- C. Regulatory Requirements
 - 1. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications.
 - a. Current adopted version of the National Electric Code (NEC)
 - b. Current adopted version of the International Building Code (IBC)
 - c. Current adopted version of the International Mechanical Code (IMC)
 - d. ANSI/ASHRAE 135-2010: Data Communication Protocol for Building Automation and Control Systems (BACNET)
 - e. Current adopted version of the International Energy Conservation Code
 - f. ASHRAE 90.1-2010: Energy Standard for Buildings

1.3 SUMMARY

- A. Section includes commissioning process requirements for electrical systems, assemblies, and equipment.
- B. Related Sections
 - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

- C. Start up of equipment and systems such as emergency power and lighting systems, etc. shall be done by or with a trained manufacturer's representative who can check and report on all items such as installation, operation, and see that the equipment or system starts and operates properly.
- D. Testing shall be performed at the convenience of the Owner and with the Owner's representatives present and the manufacturer's representative of the equipment and/or system present.

1.4 ABBREVIATIONS

- A. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Definitions are found in Section 1.5.

A/E- Architect and Design Engineers	GC- General Contractor
CxA- Commissioning Authority	MC- Mechanical Contractor
TC- Temperature Controls Contractor	OR- Owner's Representative
CM- Construction Manager	PC- Prefunctional Checklist
Cx- Commissioning	PM- Project Manager (of the Owner)
Cx Plan- Commissioning Plan	FPT- Functional Performance Test
EC- Electrical Contractor	TAB- Test and Balance Contractor

1.5 DEFINITIONS

- A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.
- B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes in accordance with the contract documents.
- C. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
- D. Basis of Design (BOD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- E. Commissioning Authority (CxA): The entity identified by the OR/PM who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.
- F. Commissioning Plan: An overall plan that provides the structure, schedule and coordination planning for the commissioning process.
- G. Construction Manager (CM): The manager contracted by the owner or architect. Generally responsible for the overall coordination of the project.
- H. Contractors: The subcontractors to the GC who provide and install building components and systems.

- I. Deferred Functional Tests: Tests that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
- J. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the contract documents (that is, does not perform properly or is not complying with the design intent).
- K. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using manual or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes. The CxA develops the functional test procedures in written form. The CxA performs or directs, coordinates, oversees, and documents the actual testing. The contractor performs the functional tests when requested by the CxA. FPT's are performed after startup are complete.
- L. General Contractor (GC): The prime contractor for this project. Generally responsible for the overall coordination of the project.
- M. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.
- N. Observation/Issue Log: The log of all commissioning related items that require current or future attention. This form is used to track all action taken on each item listed overtime until the items are resolved.
- O. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- P. Phased Commissioning: Commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order to minimize the total construction time. Commissioning shall be provided for each phase according to the schedule for that phase. Some repetition and/or remobilization may be required.
- Q. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
- R. Startup: The initial starting or activating of dynamic equipment.
- S. Trending: Monitoring using the building control system.
- T. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at substantial completion and extends for at least one year, unless specifically noted otherwise in the contract documents and accepted submittals.

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor's commissioning responsibilities are as follows (all references apply to commissioned systems and equipment only):
 - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation.

2. Cooperate with the CxA for resolution of issues recorded in the observation/issue log.
3. Attend commissioning team meetings.
4. Include the cost of commissioning assistance in the contract price.
5. Address incomplete work before functional performance testing.
6. Provide skilled technicians to execute startup of equipment. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
7. Provide skilled technicians to participate and assist under the direction of the CxA for specified equipment. Provide manufacturer's representative as required and as specified in the specification.
8. Submit approved equipment data sheets on systems to be commissioned to the CxA for review.
9. Submit all approved equipment data sheets, approved sequence of operations to the CxA.
10. Provide all training as specified.

1.7 CxA'S RESPONSIBILITIES

- A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving, non-conformance or deficiencies, but ultimately that responsibility resides with the GC and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing, observe and document performance—that systems are functioning in accordance with the documented design intent and contract documents. The contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems.
1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 2. Coordinate the commissioning work with the GC/CM to ensure that commissioning activities are being scheduled into the master schedule.
 3. Revise, as necessary, the commissioning plan.
 4. Plan and conduct a commissioning kickoff meeting and other commissioning meetings.
 5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
 6. Write the functional performance test procedures for equipment and systems.
 7. Analyze any functional performance trend logs and monitoring data to verify performance.

8. Perform or direct, witness and approve manual functional performance tests. Coordinate retesting as necessary until satisfactory performance is achieved.
9. Maintain the observation/issue log and distribute to the team.
10. Review the training of the owner's operating personnel when defined in the contract documents.
11. Provide a final commissioning report.
12. Perform or direct, witness and supervise required seasonal or deferred testing and deficiency corrections.

1.8 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxA for inclusion in the commissioning plan:
 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
 3. Process and schedule for completing prefunctional checklists and manufacturer's prestart and startup checklists for electrical systems, assemblies, equipment, and components to be verified and tested.
 4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
 5. Certificate of readiness certifying that electrical systems, subsystems, equipment, and associated controls are ready for testing.
 6. Test and inspection reports and certificates.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

- A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify that testing and adjusting procedures have been completed and that testing and adjusting reports have been submitted, discrepancies corrected, and corrective work approved.

- D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 TESTING VERIFICATION

- A. Prior to performance of testing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.
- B. Notify the CxA at least 10 days in advance of testing Work, and provide access for the CxA to witness testing Work.
- C. Provide technicians, instrumentation, and tools to verify testing of electrical systems at the direction of the CxA.
 - 1. The CxA will notify testing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
 - 2. The testing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 - 3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing and adjusting report.
 - 4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of electrical testing shall include all components, equipment, and systems as outlined in outlined later in this section.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response to input signals.
- D. The CxA along with the Electrical Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.

- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

3.4 VARIABLE FREQUENCY DRIVES

- A. All variable frequency drives shall be tested, connected in its final location to the building power system, under 100% motor load for compliance with the frequency and notch requirements specified under the Variable Frequency Drive section of the specification. The Contractor shall add any necessary filtering to the drive(s) to meet the specification.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. Documentation: The CxA shall perform or direct, witness, and document the results of all functional performance tests using the specific procedural forms developed for that purpose. The CxA will include the filled out forms in the final report.
- B. Non-conformance
 - 1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the GC/CM and the contractors in the observation/issue log.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA.
 - 3. As testing progresses and deficiencies are identified, the CxA shall discuss such deficiencies with the commissioning team and responsible contractors.
 - a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct the deficiency, the CxA will document it in the observation/issue log and require the responsible contractor to respond to the item in the log. The contractor shall reschedule the test and the test is repeated by the CxA.
 - b. If there is a dispute about a deficiency, specifically whether or not it is a deficiency, the dispute shall be documented in the observation/issue log. Resolutions will be made at the lowest management level possible. Other parties will be brought into the resolution discussions as needed. Final authority is with the A/E. Final acceptance authority is with the OR/PM. The CxA will document the resolution process. Once the resolution has been accepted, the contractor corrects the deficiency, responds in the observation/issue log certifying the equipment is ready to be retested, and sends the log back through the GC/CM to the CxA. The

contractor shall reschedule the test and the test is repeated by the CxA until satisfactory performance is achieved.

C. Cost of Retesting

1. The cost for the contractor to retest a functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC/CM.

D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the A/E or CxA. In such case, the contractor shall provide the OR/PM or GC/CM with the following:

1. Within one week of notification from the OR/PM or GC/CM, the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the OR/PM or GC/CM within two weeks of the original notice.
2. Within two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The A/E will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the contractor and the A/E will be allowed to test the installations for up to one week, upon which the A/E will decide whether to accept the solution.
5. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

E. Approval: The CxA notes each satisfactorily demonstrated function on the test form. Final approval of the functional tests is made after review by the CxA and by the OR/PM, following recommendations by the A/E.

END OF SECTION

**SECTION 26 27 02
EQUIPMENT WIRING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install the electrical connections indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment included in this Section may be specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:
 - 1. HVAC motors, VFDs, and panels

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section.
- B. Section 260533 Raceway and Boxes for Electrical Systems.
- C. Section 260519 Low-Voltage Electrical Power Conductors and Cables.

1.3 COORDINATION

- A. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 - PRODUCTS

2.1 OTHER PRODUCTS

- A. Refer to related sections for other product requirements.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to equipment using flexible PVC-coated metal conduit.
- C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.
- D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

3.4 HVAC AND PLUMBING CONNECTIONS

- A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.
- B. Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.
- C. Unless otherwise specified, all electrical motors and control devices such as aquastats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.
- D. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
- E. Check for proper rotation of each motor.

END OF SECTION

**SECTION 26 29 00
MOTOR CONTROLLERS**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install combination magnetic motor starters indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

- A. Applicable provisions of Division 1 shall govern work under this Section.
- B. Section 260529 – Hangers and Supports for Electrical Systems.
- C. ANSI/NEMA ICS 6 Enclosures for Industrial Controls and Systems.
- D. ANSI/UL 198E Class R Fuses.
- E. NEMA AB 1 Molded Case Circuit Breakers.
- F. NEMA ICS 2 Industrial Control Devices, Controllers, and Assemblies.
- G. NEMA KS 1 Enclosed Switches.

1.3 SUBMITTALS

- A. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.4 COORDINATION WITH OTHER TRADES

- A. Motors: In general, all electric motors required for this installation will be supplied with equipment, apparatus and/or appliances covered under other sections of the Specifications.
- B. For the sake of consistency and conformity of manufacturer, design and construction, all motors shall conform to the following description unless otherwise noted or required.
 - 1. Motors 3/4 HP and smaller shall be wound for operation on single phase, 60 Hz. service unless otherwise noted.
 - 2. Motors 1 HP and above shall be wound for operation on 3 phase, 60 Hz service unless otherwise noted.
 - 3. Refer to drawings in each case in order to verify voltage characteristics required.
- C. Equipment:
 - 1. All building utility motors such as fans, pumps, overhead doors, etc., together with certain "controlling equipment" for same, except motor starters and related apparatus, will be

furnished under other sections of the specifications and delivered to the building site unless specifically noted otherwise. The above mentioned "controlling equipment" pertains to electrical thermostats, electro-pneumatic and pneumatic-electric and detection devices, or any other device not purely electrically operating in nature.

- D. The starters for these motors shall be furnished and installed by the Electrical Trade unless noted otherwise. (See mechanical equipment schedules on Drawings.)
- E. The Electrical Trade shall set and connect all specified starting equipment, install all power conduits and wiring and shall furnish and make all connections from starting equipment to motors as required to leave the apparatus in running condition.
- F. Wiring Connections:
 - 1. Furnish branch circuits for all motors to the starting equipment and then to the motors, complete with all control wiring for automatic and remote control where required or noted. Conduits to motors shall terminate in the conduit fittings on the motors, the final connection being made with flexible, PVC-coated metal conduit.
- G. Provide all necessary labor and material to completely connect all electrical motors and controls (where required) in connection with the building utility equipment, including fans, pumps, overhead door operators, etc.
- H. All conduits and wiring required for control work from the holding coil circuit of the starter, including the furnishing and installation of control devices such as auxiliary contacts, control relays, time delay relays, pilot lights, selector switches, alternators, etc., shall be provided and installed by other trades unless otherwise indicated.
- I. Power Branch Circuits:
 - 1. Wire sizes for branch circuits not specifically called for on drawings or in specifications shall be based on 125 percent of the full load current of the motor unless the voltage drop of motor branch circuits exceeds 1-1/2 percent from the distribution panel to the motor; in which case, voltage drop shall govern wire sizes. A power factor of 80 percent shall be used for motors in such calculations.

1.5 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.7 SPARE PARTS

- A. Provide three (3) spares of each size and type fuse used.

PART 2 - PRODUCTS

2.1 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower; size 0 minimum.
- B. Full Voltage Starting: Non-reversing type.
- C. Size: NEMA ICS 2; size as shown on Drawings, size 0 minimum.
- D. Coil Operating Voltage: 120 volts, 60 Hz.
- E. Overload Protection: Electronic Class 10/20/30, field selectable.
- F. Enclosure: NEMA Type: As indicated on the drawings.
- G. Provide manufacturer's equipment ground kit in all starter enclosures.
- H. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact.
- I. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.
- J. Indicating Lights: NEMA ICS 2; LED Push-to-test type. RUN: red in front cover.
- K. Relays: NEMA ICS 2; Provide on-time delay (0-60 sec) relays as indicated on the Drawings.
- L. Provide phase loss protection relay with each motor starter, with contacts to de-energize each motor starter.
- M. Control Power Transformers: Each magnetic starter shall have a fused primary and a fused 120V secondary control transformer, sized for the load, 100 VA minimum. Additionally, the X2 terminal of the control transformer shall be grounded.
- N. Combination Motor Starters: Combine motor starters with fusible switch in common enclosure.

2.2 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

- A. 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. Fuse Clips: Designed to accommodate Class R fuses.

2.3 FUSES

- A. Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class RK 5. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

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- A. Install motor control equipment in accordance with manufacturer's instructions.
- B. Connect hand-off auto selector switches so that automatic control only is by-passed in "manual" position and any safety controls are not by-passed.
- C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.2 ADJUSTING

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.
- B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

3.3 TESTING

- A. Perform in accordance with the manufacturer's recommendations. Include the following visual and mechanical inspections and electrical tests:
 - 1. Visual and Mechanical Inspection
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical, electrical, and mechanical condition.
 - c. Inspect contactors.
 - d. Clean motor starters.
 - e. Verify overload element/unit ratings are correct for their applications.
 - f. If motor-running protection is provided by fuses, verify correct fuse rating.
 - g. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.

END OF SECTION

**SECTION 26 56 29
SITE LIGHTING**

PART 1 - GENERAL

1.1 SCOPE

- A. Perform all Work required to provide and install site lighting indicated by the Contract Documents with supplementary items necessary for proper installation.
- B. Equipment included in this Section
 - 1. Exterior luminaires and accessories

1.2 REFERENCES

- A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire, pole and base.
- B. Product Data: Provide dimensions, ratings, performance data, lamp and ballast data, weights and accessory information for each type.
- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under "Regulatory Requirements".
 - 2. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.4 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.5 WARRANTY

- A. All equipment shall be warranted to be free of defects in materials and workmanship by the manufacturer for the time period listed below from the date of project substantial completion:
 - 1. LED luminaires (including LED power supply): Five (5) years

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as specified in schedule on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturers' instructions. Provide all required mounting boxes, cable connectors, conduit seals, etc. as required for a complete fixture installation.
- B. Bond each luminaire, each metal accessory, the ground rod and the pole to the branch circuit equipment ground conductor with a separate ground wire sized per NEC or as shown on the drawings.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.3 ADJUSTING

- A. Aim and adjust luminaires as indicated on Drawings or as directed by the A/E.

3.4 CLEANING

- A. Clean photometric control surfaces.
- B. Clean finishes and touch up damage.

END OF SECTION

**SECTION 32 17 23
PAVEMENT MARKINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Painted pavement markings.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

- A. AASHTO M 247 - Standard Specification for Glass Beads Used in Pavement Markings.
- B. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work of this section with adjoining work.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate survey control points and pavement markings.
- C. Product Data: Manufacturer's data sheets on each product to be used.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.
 - 2. Extra Paint: One container, 1 gallon size, of each type and color.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment, accompanied by batch certificate.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

1.09 SEQUENCING

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Painted Pavement Markings:
 - 1. PPG Traffic Solutions; Ennis Flint Fast Dry Waterborne Traffic Paint, 9852x Series.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTED PAVEMENT MARKINGS

- A. Painted Pavement Markings: As indicated on drawings.
 1. Marking Paint: In accordance with AASHTO MP 24.
 - a. Symbols and Text: White and Red
 2. Reflective Glass Beads: Type 1, in accordance with AASHTO M 247.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify existing markings for removal.
- B. Verification of Conditions: Verify that pavement is dry and ready for installation.
- C. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

- A. Establish survey control points for locating and dimensioning of markings.
- B. Clean surfaces prior to installation.
 1. Remove dust, dirt, and other debris.
- C. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

- A. General:
 1. Position pavement markings as indicated on drawings.
 2. Field location adjustments require approval of Architect.
- B. Painted Pavement Markings:
 1. Apply in accordance with manufacturer's instructions.
 2. Marking Paint: Apply uniformly, with sharp edges.
 - a. Applications: One coat.
 - b. Wet Film Thickness: 0.015 inch, minimum.
 - c. Stencils: Lay flat against pavement, align with striping, remove after application.
 - d. Glass Beads: Apply directly to paint, 10 second lag time, 6 lbs/gal of paint, uniform thickness and coverage.

3.04 TOLERANCES

- A. Maximum Variation From True Position: 3 inches (76 mm).
- B. Maximum Offset From True Alignment: 3 inches (76 mm).

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for additional requirements.
- B. Temporary Markings: Remove without damaging surfaces.

3.07 PROTECTION

- A. Replace damaged or removed markings at no additional cost to Owner.
- B. Preserve survey control points until pavement marking acceptance.

END OF SECTION