PROJECT MANUAL

UACCB
GATEWAY CENTER
FARM

2210 E. Main Street
Batesville, Arkansas 72501

100% CONSTRUCTION DOCUMENTS

April 18, 2024

FENNELL | PURIFOY
ARCHITECTS

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INVITATION TO BID
Section 001300

Fennell Purifoy Architects
100 River Bluff Drive, Suite 320
Little Rock, AR 72202
(501) 372-6734

1. You are invited to bid on a General Contract for the renovation of the Gateway Center FARM, The Board of Trustees of the University of Arkansas acting on the behalf of the University of Arkansas Community College at Batesville hereinafter termed Owner. The bids shall be on a lump sum basis.

2. There will be a non-mandatory Pre-Bid Conference held at 10:00 a.m., local time, Monday, April 28, 2025 at 2210 E. Main Street on the University of Arkansas Community College at Batesville Campus.

3. The Owner will receive bids until 2:00 p.m., local time, Wednesday, May 7, 2025. Bids may be mailed or delivered to University of Arkansas Community College at Batesville, Attn: Peggy Jackson, Procurement Manager, UACCB, 2221 White Drive, Batesville, Arkansas 72501, hereinafter termed Campus. Bids received after this time will not be accepted. Bids will be publicly opened and read aloud in Room IH 104 on the Campus at the time and date mentioned. Interested parties are invited to attend.

4. The Owner, unless designated to another entity, supervises the bidding and awarding of all construction contracts, approves contracts, change orders, requests for payment and ensures that on-site inspections are accomplished.

5. Prime Bidders may obtain a complete set of contract documents from Southern Reprographics, West Seventh, Little Rock, AR 72201 (501)372-4011, with a $200 refundable deposit per set for up to 3 sets of drawings and specifications. Prime Bidders will be refunded the deposit (only if they submit a bid) upon return of documents and within ten days of the bid opening. Digital copies can be purchased at the bidder's expense. .

6. Obtaining contract documents through any source other than the Design Professional listed above, or his representative(s) is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information. The documents obtained through the Architect or his representative(s) are considered the official version and take precedence if any discrepancies occur.

7. Bid Security in the amount of five percent (5%) of the bid must accompany each bid in excess of $50,000.00 in accordance with the Instructions to Bidders.

8. Bidders are hereby notified that any bidder who desires to enter into Contract for this work must comply with disclosure requirements pursuant to Governor's Executive Order 98-04. Submission to the Owner of completed Disclosure forms will be a condition of the Contract. The Owner cannot enter into any contract which does not

obligate the contractor to require the submission of Disclosure forms for subcontractors.

9. The Owner reserves the right to reject any and all bids, and to waive any formalities.

10. This invitation does not commit the Owner to pay any cost incurred in the preparation of bids.

11. Bidders shall conform to the requirements of the Arkansas licensing laws and regulations for contractors and shall be licensed before his bid is submitted unless the project is federally funded and therefore excepted by Ark. Code Ann. §17-25-315.

12. There shall be only one bid submitted per State Contractors license. Bidders will be required to indicate license number on bid form beneath signature when bidding $50,000.00 or more.

13. Pursuant to Ark. Code Ann. § 22-9-203, the State encourages all small and minority business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration be given to the identified groups.

14. EQUAL OPPORTUNITY POLICY

    Act 2157 of 2005 of the Arkansas Regular Legislative Session requires that any business or person bidding, responding to a request for proposal or qualifications, or negotiating a contract with the State of Arkansas for professional or consultant services, submit their most current equal opportunity policy (EO Policy)

15. COMBINED CERTIFICATIONS FOR CONTRACTING WITH THE STATE OF ARKANSAS

DEPARTMENT OF TRANSFORMATION AND SHARED SERVICES
OFFICE OF STATE PROCUREMENT

COMBINED CERTIFICATIONS FOR CONTRACTING WITH THE STATE OF ARKANSAS

Pursuant to Arkansas law, a vendor must certify as specified below and as designated by the applicable laws.

1. **Israel Boycott Restriction:** For contracts valued at $1,000 or greater.
   A public entity shall not contract with a person or company (the "Contractor") unless the Contractor certifies in writing that the Contractor is not currently engaged in a boycott of Israel. If at any time after signing this certification the Contractor decides to boycott Israel, the Contractor must notify the contracting public entity in writing. *See* Arkansas Code Annotated § 25-1-503.

2. **Illegal Immigrant Restriction:** For contracts valued at $25,000 or greater.
   No state agency may contract for services with a Contractor who knowingly employs or contracts with an illegal immigrant. The Contractor shall certify that it does not knowingly employ, or contract with, illegal immigrants. *See* Arkansas Code Annotated § 19-11-105.

3. **Energy, Fossil Fuel, Firearms, and Ammunition Industries Boycott Restriction:** For contracts valued at $75,000 or greater.
   A public entity shall not contract unless the contract includes a written certification that the Contractor is not currently engaged in and agrees not to engage in, a boycott of an Energy, Fossil Fuel, Firearms, or Ammunition Industry for the duration of the contract. *See* Arkansas Code Annotated § 25-1-1102.

4. **Scrutinized Company Restriction:** Required with bid or proposal submission.
   A state agency shall not contract with a Scrutinized Company or a company that employs a Scrutinized Company as a subcontractor. A Scrutinized Company is a company owned in whole or with a majority ownership by the government of the People's Republic of China. A state agency shall require a company that submits a bid or proposal for a contract to certify that it is not a Scrutinized Company and does not employ a Scrutinized Company as a subcontractor. *See* Arkansas Code Annotated § 25-1-1203.

By signing this form, the Contractor agrees and certifies they are not a Scrutinized Company and they do not currently and shall not for the aggregate term a resultant contract:

- Boycott Israel.
- Knowingly employ or contract with illegal immigrants.
- Boycott Energy, Fossil Fuel, Firearms, or Ammunition Industries.
- Employ a Scrutinized Company as a subcontractor.

Contract Number: _____ Description: _____

Agency Name: _____

Vendor Number: _____ Vendor Name: _____

_____ _____
Vendor Signature Date

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ATTENTION BIDDERS

Act 2157 of 2005 of the Arkansas Regular Legislative Session requires that any business or person bidding, responding to a request for proposal or qualifications, or negotiating a contract with the state for professional or consultant services, submit their most current equal opportunity policy (EO Policy).

This is a mandatory requirement when submitting an offer as described above.

Should you have any questions regarding this requirement, please contact my office by calling (870)612-2030.

Sincerely,

Peggy W. Jackson
Purchasing Specialist
University of Arkansas Community College at Batesville

To be completed by business or person submitting response: (check appropriate box)

_____ **EO Policy Attached (mandatory)**

_____ **EO Policy previously submitted to UACCB Purchasing Department**

Company Name Or Individual
_____

Title: _____ **Date:** _____

Signature: _____

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CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

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

SOCIAL SECURITY NUMBER | FEDERAL ID NUMBER | SUBCONTRACTOR: | SUBCONTRACTOR NAME:

TAXPAYER ID #: ___ ___ OR ___ ☐ Yes ☐ No

IS THIS FOR:

TAXPAYER ID NAME: ☐ Goods? ☐ Services? ☐ Both?

YOUR LAST NAME: FIRST NAME: M.I.:

ADDRESS:

CITY: STATE: ZIP CODE: --- COUNTRY:

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

FOR INDIVIDUALS*

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

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

☐ **None of the above applies**

FOR AN ENTITY (BUSINESS)*

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

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

☐ **None of the above applies**

Contract and Grant Disclosure and Certification Form

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

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

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

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

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

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

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

Signature_____ Title_____ Date_____

Vendor Contact Person_____ Title_____ Phone No._____

Agency use only

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

Revised 01/03

Minority & Women-Owned Business Bid Form

Minority participation is encouraged in all procurements by state agencies. "Minority is defined by Arkansas Code Annotated § 1-2-503 as 51% owned by "an African American, Hispanic American, American Indian, Asian American, or Pacific Islander American, or a Service-disabled Veteran as designated by the United States Department of Veteran Affairs." The Arkansas Economic Development Commission conducts a certification process for minority businesses. Bidders unable to include minority-owned business as subcontractors "may explain the circumstances preventing minority inclusion."

Check type: □ African American □ Hispanic American □ American Indian □ Women Owned □ Native American □ Asian □ Pacific Islander □ Disabled Veteran

Arkansas Economic Development Commission certificate (if available)
#_____

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INSTRUCTIONS TO BIDDERS
Section 002000

1. **BIDDING DOCUMENTS**. General Contractors may obtain up to 3 complete sets, on deposit for the amount specified in the Invitation to Bid, of Contract Documents from issuing office designated in the Invitation to Bid. Additional sets may be purchased by the General Contractor for the actual cost of printing. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. Obtaining Contract documents through any source other than the Design Professional listed in the Invitation to Bid is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information. The documents obtained through the Design Professional or his representative(s) or the University of Arkansas Community College Procurement Office are considered the official version and take precedence if any discrepancies occur. The fact that documents used for bidding purposes are named "contract documents" does not diminish in any way the right of the Owner to reject any and all bids and to waive any formality.

2. **EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK**. Bidder shall examine the Contract Documents and visit the project site of work. Bidder shall become familiar with all existing conditions and limitations under which the Work is to be performed, and shall base bid on items necessary to perform the Work as set forth in the Contract Documents. No allowance will be made to Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination.

3. **INTERPRETATION OF CONTRACT DOCUMENTS DURING BIDDING**.

All references to the Owner shall be interpreted to mean University of Arkansas Community College at Batesville.

If any person contemplating submitting a Bid is in doubt as to the true meaning of any part of the Contract Documents or finds discrepancies in or omissions from any part of the Contract Documents, he may submit to the Design Professional a written request for an interpretation or correction thereof not later than five (5) calendar days before Bid opening. In those instances where a Design Professional is not involved with the project, written requests for interpretation or correction may be made to the University of Arkansas Community College at Batesville Procurement Department within the time frame stated above.

3.3 Address all communications regarding the Contract Documents to the Design Professional: Fennell Purifoy Architects; 100 River Bluff Drive, Suite 320; Little Rock, AR 72202; (501) 372-6734.

Interpretation or correction of the Contract Documents will be made only by Addendum and will be mailed, faxed or delivered to each Bidder of record by the Design Professional; and in those instances where a Design Professional is not involved the University of Arkansas Community College at Batesville Procurement Department shall distribute Addenda in the above referenced manner. The Owner will not be responsible for oral explanations or interpretation of the Contract Documents.

Addenda issued during the bidding period will be incorporated into the Contract Documents.

4. **SUBSTITUTIONS**.

Materials, products, and equipment described in the Contract Documents establish a standard of required function and a minimum desired quality or performance level, or other minimum dimensions and capacities, to be met by any proposed substitution. Acceptability of substitutions will not be considered during bidding period.

In some cases, prior approval of material or equipment, or both shall be obtained from Owner in order to obtain the desired color, size, visual appearance, and other features specified.

5. **TYPE OF BID**.

The Work under this Contract will be awarded under a stipulated sum contract to the lowest responsible base bid amount. No segregated bids or assignments will be considered. Bids are to include all labor, materials, equipment, sales tax, social security tax, State Unemployment Insurance and all other like items necessary to complete this project.

Any estimate of quantities is approximate only and shall be the basis for receiving unit price bids for each item, but shall not be considered by the Bidder as the actual quantities that may be required for the completion of the proposed work. Bidder shall state a unit price for every item of work named in the Proposal. Bidder shall include, in the unit prices, furnishing of labor, materials, tools, equipment, and apparatus of every description to construct, erect, and finish the Work. The unit price bid for the items shall be shown numerically and in the appropriate spaces provided on the Bid Form. Such figures shall be clear and distinctly legible so that no question can arise as to their intent or meaning. Unit price bids and totals shown in the Bid Form shall not include costs of engineering, advertising, printing and appraising.

6. **PREPARATION OF BID**. Bid shall be made on an unaltered Bid Form identical to the form included with the Contract Documents. Fill in all blank spaces and submit one original. Bids shall be signed with name typed below the signature. Where Bidder is a corporation, bids shall be signed with the legal name of the corporation followed by the name of the state of incorporation, contractor's license number issued by the Contractors Licensing Board, and the signature of an authorized officer of the corporation.

Bids submitted by a "Joint Venture/Joint Adventure" shall be signed by representatives of each component part of the Joint Venture. The licenses of each component part of the Joint Venture shall also be listed in the bid submittal. Therefore, joint venture bidders shall indicate at least two (2) signatures and two (2) license numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a "Joint Venture" need only to indicate the joint venture license number on the Bid Form. Joint Venture bidders shall indicate at least two (2) signatures on the Bid Form even if they are licensed as a joint venture.

7. **BID GUARANTEE AND BONDS**.

Each bid proposal shall include a bid security in the amount of five percent of the total bid offered, if the bid is in excess of $50,000.00. The bidder will be required to submit a bidder's deposit, which includes enclosing a cashiers check payable to the order of the OWNER drawn upon a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to five (5) percent of the bid. The bidder shall include in the bid the bid bond amount so that the bid represents the total cost to the Owner of all work included in the contract.

The bid bond shall indemnify the Owner against failure of the Contractor to execute and deliver the contract and necessary bond (Performance and Payment Bond) for faithful performance of the contract. The bid bond shall provide that the contractor or surety must pay the damage, loss, cost and expense

subject to the amount of the bid security directly arising out of the Contractor's default in failing to execute and deliver the contract and bonds.

Owner will have the right to retain the bid security of bidders to whom an award is being considered until the Contract has been executed and bonds if required, have been furnished, or until specified time has elapsed so that bids may be withdrawn, or all bids have been rejected.

Should Bidder fail to enter into a contract and furnish the required bonds and insurance certificates within ten (10) days after receipt of Intent to Award, the bid guarantee will be forfeited to the Owner as liquidated damages.

8. **PERFORMANCE AND PAYMENT BOND**. Performance and Payment Bonds are not required for bids $50,000.00 or under, except for roofing projects. For work exceeding $50,000.00, the bidder shall furnish a Performance and Payment Bond in the amount equal to 100 percent of contract price, on a form identical to the Arkansas Statutory Performance and Payment Bond Form included with the Contract Documents as security for faithful performance of the Contract and payment of all obligations arising thereunder within ten days after receipt of the Intent to Award. The bond shall be written by a surety company qualified and authorized to do business in the State of Arkansas. The bond shall be executed by a resident local agent or non-resident agent licensed by the State Insurance Commissioner to represent the surety company. The bond shall be written in favor of the Owner. Bidder shall file the bond with the Circuit Clerk in the county where the Work is to be performed. Failure to deliver said bonds, as specified, shall be considered as having abandoned the Contract and the bid security will be retained as liquidated damages. The bidder shall include in the bid the Performance and Payment bond amount so that the bid represents the total cost to the Owner of all work included in the contract.

9. **SUBCONTRACTORS**. Name of principal subcontractors shall be listed where indicated on the Bid Form in accordance with Ark. Code Ann. § 22-9-204 and the contract documents. All prime contractors, as a condition to perform construction work for and in the State of Arkansas, shall use no other subcontractors when the subcontractor's portion of the project is $50,000.00 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC), Plumbing, Electrical and Roofing.

   A bidder should request clarification from the Design Professional (or from (CAMPUS) Procurement Department, if no Design Professional exists for the project), if the bidder determines a type of work (mechanical –indicative of HVAC; electrical – indicative of wiring and illuminating fixtures; plumbing; roofing and sheet metal work - indicative of roofing application) is a component of the project, but space has not been provided on the bid form for the listing of such or if the bid form lists a type of work that is not a component of the project. Clarification should be made in accordance with Instruction 3.3.

   For those bids where the listed subcontract work is $50,000.00 or more, the prime contractor must make a decision as to which subcontractor he intends to use. The prime contractor shall place the names of each subcontractor and indicate whether the amount of the listed work is $50,000.00 or more in the space provided on the Bid Form. The prime contractor may use his own forces to do the listed work, however, if the listed work is $50,000.00 or more, the prime contractor must be qualified and licensed by the Arkansas Contractors Licensing Board to perform the listed work. Once the prime contractor determines his own forces will be used, he shall place his name, and indicate in he space provided on the Bid Form whether the amount of the listed work is $50,000.00 or more. Failure to complete the form correctly shall cause the bid to be declared non-responsive, and the bid will not receive consideration.

A subcontractor, including the prime contractor listed as using his own forces, may contract a portion of the listed work. However, a subcontractor is prohibited from subcontracting the work in its entirety.

9.1.1 In the event the amount of the listed subcontract work is below $50,000.00, the Prime

Contractor shall place the names of the person or firm performing the work and indicate in the space provided on the Bid Form whether the listed work is under $50,000.00.

9.2.2 It shall be mandatory that any subcontractors listed in (A) – (D) on the Bid Form by the Prime Contractor is awarded a contract under Ark. Code Ann. § 22-9-204. Prime Contractors who submit a bid listing unlicensed subcontractors or use unlicensed subcontractors on a state project or any subcontractor not licensed by the Contractors Licensing Board who perform work having a value of $50,000.00 or more on a state project are subject to a civil penalty, after notice and hearing, of not less than $250.00 nor more than $500.00 and may be suspended from bidding on state projects. In the event that one (1) or more of the subcontractors named by the prime contractor in his successful bid thereafter refuse to perform his contract or offered contract, the prime contractor may substitute another subcontractor, after having obtained prior approval from the design professional, and the owner.

9.3. Electrical License Requirement

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

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

9.4 Pursuant to Ark. Code Ann. § 22-9- 404, the Bidder may require listed subcontractors (mechanical, plumbing, electrical and roofing/sheet metal) whose bid to the Contractor exceeds $50,000.00 to provide a Performance and Payment Bond to the Bidder.

10. **SUBMITTAL**. Submit bid on the Bid Form in an opaque, sealed envelope. Identify the envelope with: project name and number, name of Bidder, and Arkansas Contractors License number; only one bid shall be submitted per State Contractors license number. Submit bids in accordance with the Invitation to Bid. All blanks on the form shall be filled out in ink or be typewritten. Erroneous entries, alterations, and erasures shall be lined out, initialed by the Bidder, and the corrected entry inserted on the Bid Form. Only those bids submitted on Owner supplied forms as found in these documents will be accepted.

PROPRIETARY INFORMATION. All bid information, proposals, forms, briefs, sales brochures, etc. will become property of the Owner when submitted with a bid. All bid documents submitted by the bidder shall be available for public inspection after the bid opening. Proprietary pages and documents required to be submitted with bid must be clearly marked as such.

11. **MODIFICATION AND WITHDRAWAL**. Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be considered. Bidder may submit written modifications to bid in writing, by telegraph, or by

facsimile at any time prior to the expiration of the bidding time and date and shall so word the modification(s) as to not reveal the amount of the original bid. Telegraph or facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.

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

13. **LATE BIDS.** Late bids, bids en route, bids left at a location other than the Office of Procurement by special carrier or other will not be considered. Bids must be in the Office of Procurement by or before the time as indicated on the Invitation to Bid.

14. **APPLICABLE LAWS**.

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

14.2 Discrimination. Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to discrimination. Upon a final determination by a court or administrative body having proper jurisdiction that the Bidder has violated state or federal laws or regulations, the Owner may impose a range for appropriate remedies up to and including termination of the Contract.

14.3 Bidder shall include in the bid all state sales tax, social security taxes, state unemployment insurance, and all other items of like nature. It is the intent that the bid shall represent the total cost to the Owner of all work included in the contract. There are no provisions for a contractor to avoid taxes by using the tax exempt number of a state agency, board, commission or institutions. Said taxes shall be included in the bid price.

14.4 State licensing laws for Contractors.

14.5 Disclosure. Potential Bidders are hereby notified that any bidder who desires to enter into a contract not exempted from the disclosure requirements, that disclosure is a condition of the Contract and that the Owner cannot enter into any such contract for which disclosures are not made and the language of paragraphs a, b, and c below will be included in the body of any contract awarded. Potential Bidders are hereby notified that:

a. Disclosure is required to be a condition of any present or future subcontract for which the total consideration is greater than twenty-five thousand dollars ($25,000.00).

b. The Contractor shall require any present or future subcontractor, for which the subcontract amount is greater than $25,000.00, to complete and sign the Contract and Disclosure and Certification. The contractor shall ensure that any agreement, current or future between the contractor and a subcontractor for which the total consideration is greater than $25,000.00 shall contain the following:

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

c. The Contractor shall transmit a copy of the subcontractor's disclosure form to the agency and a statement containing the dollar amount of the subcontract within ten (10) days upon receipt of subcontractor's disclosure.

Note: A copy of the "Contract and Grant Disclosure and Certification Form" is included at the end of this division.

14.6 Minority Participation: Pursuant to Ark. Code Ann. § 22-9-203, the Owner and the State of Arkansas encourage all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

14.7 The bidding, award and administration of the contract shall be made pursuant to Ark. Code Ann. §14-4-1401 et seq., Ark. Code Ann. § 22-9-101 et seq., and Ark. Code Ann. § 22-2-101 et seq.

15. **LIQUIDATED DAMAGES**. The amount of liquidated damages to be assessed shall be in accordance with the amount indicated in the Contract. Bidder understands and agrees that under the terms of the Contract to be awarded, if the Contractor fails to complete the work within the time limit specified in the Contract, the Contractor shall pay the Owner as Liquidated Damages, and not in the nature of a penalty the sum specified in the Bid Form for each day completion is delayed. It is further understood and agreed by bidder that the said sum fixed as Liquidated Damages is a reasonable sum considering the damages that Owner will sustain in the event of any delay in completion of the Work, and said sum is herein agreed upon and fixed as Liquidated Damages because of difficulty in ascertaining the exact amount of damages that may be sustained by such delay.

16. **PRE-BID CONFERENCE.** Refer to Invitation To Bid, section 00130, for information concerning any Pre-bid Conferences.

17. **OPENING**. Bids will be opened as identified in the Invitation to Bid, section 00130.

18. **EVALUATION and CONSIDERATION OF BIDS**, It is the intent of the Owner to award a Contract to the lowest responsive qualified bidder provide the bid has been submitted in accordance with the requirements of the Contract Documents and does not exceed the funds certified for the project by more than 25%. The Owner shall have the right to waive any formalities in a bid received and to accept the bid which, in the Owner's judgment, is in its best interests. The Owner shall have the right to accept any or all bids for a period not to exceed thirty (30) days.

18.1 Tie Bids. If two or more sealed bids are equal in amount, meet Bidding Document requirements, and are the lowest received by the time of the bid opening, then the apparent low bidder will be determined by lot (placing the name of the tie bidders into a container and drawing one name). The drawing will be conducted by UACCB Procurement Department personnel, and another person so designated by the Owner in the presence of a witness and the tie bidders or representatives. The witness shall be an employee of the State of Arkansas. Documentation of the drawing shall be included on the bid tabulation and be signed by those present. Nothing in the above and foregoing will diminish the Owner's reserved right to reject any and all bids and to waive any formalities.

19. **EXECUTION OF CONTRACT**.

19.1 The apparent low Bidder shall be prepared, if so required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract. Attention is called to the fact that the bidder in signing the proposal, represents that he has the financial ability and experience to carry out the work throughout its several stages within the time for completion set forth on the Bid Form.

19.2 The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance within ten days after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond.

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

END OF DOCUMENT

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BID FORM

Section 004100

Bid Time: 2:00 p.m. Local Time

Bid Date: May 7, 2025

Location: Room IH 104 (Independence Hall), UACCB, Batesville, Arkansas

BID FROM: _____

BID TO: University of Arkansas Community College at Batesville
(if mailing bid – send to Attn: Peggy Jackson, Procurement Manager, UACCB, 2221 White Drive, Batesville, Arkansas 72501,

PROJECT: UACCB Gateway Center FARM

Gentlemen:

1. Having carefully examined the Contract Documents for this project, as well as the premises and all conditions affecting the proposed construction, the undersigned proposes to provide all labor, materials, services, and equipment necessary for, or incidental to, the construction of the project in accordance with the Contract Documents within the time set forth, for the lump sum base bid of:

   $

   _____

   Dollar Amount Is To Be Shown Numerically

3. Completion Date: Bidder agrees that the project must be completed 180 days from the notice to proceed date.

4. The undersigned, in compliance with the Contract Documents for the construction of the above named project, does hereby declare:

   a. That the undersigned understands that the State reserves the right to reject any and all bids and to waive any formality.
   b. That if awarded the Contract, the undersigned will enter into an Agreement, on a form identical to the form included in the Contract Documents and execute required performance and payment bonds within 7 days after receipt of the Intent to Award, will commence work within 10 days after the date of the Notice to Proceed, and will complete the Contract fully by Completion Date indicated. Should the undersigned fail to fully complete the work within the above stated time, he shall pay the Owner as fixed, agreed and liquidated damages and not as a penalty, the sum of Two Hundred Dollars ($200) for each calendar day of delay until the work is completed or accepted.
   c. The undersigned further agrees that the bid security payable to Owner and accompanying this proposal shall become the property of the Owner as liquidated damages if the undersigned fails to execute the Contract or to deliver the required bonds to the Owner within 10 days from receipt of the Intent to Award as these acts constitute a breach of the Contractor's duties.
   d. That this bid may not be withdrawn for a period of 60 days after the bid opening.

e. The undersigned understands that the Owner's intent is to construct all facilities proposed within the limits established by the funds appropriated for the project.
f. The names of subcontractors and the nature of the work to be performed by each one have been included on the Bid Form.
g. Bids submitted by a "Joint Venture/Joint Adventure" shall be signed by representatives of *each component part* of the Joint Venture. The licenses of *each component part* of the Joint Venture shall also be listed in the bid submittal. Therefore, joint venture bidders shall indicate at least two (2) signatures and two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a "Joint Venture" need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the bid form even if they are licensed as a joint venture.

5. The following documents are attached to and made a condition of this Bid.
   a. Bid security.
   b. Listing of Mechanical, Plumbing and Electrical Subcontractors, if required.

6. The undersigned acknowledges receipt of and inclusion as a part of the Contract Documents the following addenda:

   No. _____Dated_____

   No. _____Dated_____

7. **LISTING OF MECHANICAL, PLUMBING, ELECTRICAL and ROOFING and SHEET METAL SUBCONTRACTORS**

   ALL MECHANICAL, PLUMBING, ELECTRICAL AND SUBCONTRACTORS SHALL BE LISTED REGARDLESS OF QUALIFICATIONS, LICENSURES OR WORK AMOUNT. BIDDERS SHOULD CONSULT THE PROJECT MANUAL ON HOW TO FILL OUT THIS FORM. FAILURE TO NAME THE SUBCONTRACTOR IN THE SPACE PROVIDED SHALL CAUSE THE BID TO BE DECLARED NON-RESPONSIVE AND THE BID WILL NOT RECEIVE CONSIDERATION.
   Indicate the Name(s), of each entity performing the listed work:

   MECHANICAL (Indicative of HVACR):

   _____
   _

   Is the amount of work $50,000.00 or over: Yes___ No ___

   PLUMBING:

   _____
   _

   Is the amount of work $50,000.00 or over: Yes___ No ___

   ELECTRICAL: (Indicative of wiring and illuminating fixtures)

   _____
   _

   Is the amount of work $50,000.00 or over: Yes___ No ___

ROOFING AND SHEET METAL:

_____

_

Is the amount of work $50,000.00 or over: Yes___ No ___

Respectfully Submitted:

_____
Name of Bidder (Typed or Printed)

_____
Address

_____
BY: (Signature and Title)

_____
Contractor's License Number or Contractor's (Joint Venture) License Number(s)

_____
Telephone Number and Fax Number

_____
Federal ID Number or SSN#

_____
Date of Bid

CONSENT OF SURETY
Section 00611

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

1. My name is and I am an authorized representative of a surety company.

2. With regards to the Project ; Project # ; Contract date ; Contractor; and Owner; I hereby approve the final payment to the contractor. I agree that the final payment to the contractor shall not relieve the Surety Company of any of its obligations as set forth in the contract with the State of Arkansas and this contractor.

_____ _____
AFFIANT DATE

VERIFICATION

STATE OF ARKANSAS
COUNTY OF _____
SUBSCRIBED AND SWORN TO before me this _____ of _____ , 20___.

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES:

PERFORMANCE BOND AND PAYMENT BOND
Section 006140

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

Principal has by written agreement dated _____ entered into a Contract (the Contract) with the Owner for: _____ .
The above referenced Contract is incorporated herein by reference.

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

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

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

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

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

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

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

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

BY: _____
Contractor Date

BY: _____
Arkansas Resident Local Agent/ Attorney-in-Fact Date
(In accordance with Ark. Code Ann. § 22-9-402(b)(1)(2))

_____
Agent Date

_____
Address

_____
City County State Zip Code

Business Phone:_____

Fax: _____

Mail:_____

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

RELEASE OF CLAIMS
Section 006400

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

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

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

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

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

_____
AFFIANT DATE

VERIFICATION

STATE OF ARKANSAS

COUNTY OF

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

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

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GENERAL CONDITIONS
Section 007000

ARTICLE 1 -- GENERAL PROVISIONS

1.1 DEFINITIONS

1.1.1 Contract Documents: Contract Documents consist of Agreement; Invitation to Bid; Instruction to Bidders; the Bid Form; the Bid and the Performance and Payment bonds; General and Supplementary Conditions; Specifications; Drawings; Addenda issued prior to execution of the Contract; all Owner approved Change Orders; other documents listed or referred to in the Agreement; and modifications issued after execution of the Contract and signed by Contractor and Owner.

1.1.2 Contract: The Contract Documents form the Contract for construction. The Contract Documents will not be construed to create a contractual relationship between the Design Professional and Contractor, between the Owner and a subcontractor, between the Owner and Design Professional, or between entities other than the Owner and Contractor.

1.1.3 Work: Construction and services required by the Contract Documents whether completed or partially completed, include tools, labor, equipment, supplies, transportation, handling, and incidentals provided by the Contractor.

1.1.4 Project: The total capital improvement project described in the Contract Documents.

1.1.5 Drawings: Graphic and textual portions of the Contract Documents showing the design, location, and dimensions and size of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

1.1.6 Specifications: Written requirements for materials, equipment, systems, standards, and workmanship for the Work, and performance of related services.

1.1.7 Project Manual: Volume, which may include the bidding requirements, forms, contracting requirements, and the Specifications.

1.1.8 Owner: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The term Owner means the Owner and the Owner-authorized representative.

1.1.9 Contractor: The person or entity identified as such in the Contract Agreement, referred to throughout the Contract Documents as singular in number. The term Contractor means the Contractor or the Contractor-authorized representative.

1.1.10 Design Professional (Architect/Engineer/Consultant): The person or entity identified as such in the Agreement, lawfully licensed to practice architecture or engineering or another field of expertise and under contract to Owner to provide design service, advice, and consultation, referred to throughout the Contract Documents as if singular in number. The term Design Professional means the Architect/Engineer/ Consultant or the authorized representative.

1.1.11 Subcontractor: Any person, firm, or corporation with a direct contract with the Contractor who acts for or in behalf of the Contractor in executing a portion of the Work. The term subcontractor is referred to as singular in number and means the subcontractor or the subcontractor-authorized representative.

1.1.12 Inspector: A duly authorized representative of the Owner, and Design Professional, designated for detailed inspection of materials, construction, workmanship, and methods of construction.

1.1.13 Site: The particular location of that part of the project being considered.

1.1.14 State: The Owner.

1.2 **INTENT**

1.2.1 The intent of the Contract Documents is to set forth the standards of construction, the quality of materials and equipment, the guarantees that are to be met, and to include items necessary for proper execution and completion of the Work. The Contract Documents are complementary and what is required by one will be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable as necessary to produce indicated results.

1.2.2 Organization of the Specifications into divisions, sections, and articles, and arrangement of Drawings will 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 which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 **CAPITALIZATION**

1.3.1 Terms capitalized in the Contract Documents include those which are specifically defined, the titles to numbered sections and articles, identified references to paragraphs, and the titles of other published documents.

1.4 **INTERPRETATION**

1.4.1 Whenever in these Contract Documents the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Owner and Design Professional is intended.

1.4.2 Whenever in these Contract Documents the word "product" is used, it shall be understood that the materials, systems, and equipment will be included.

1.4.3 Whenever in these Contract Documents the word "provide" is used, it shall be understood that it means to "furnish and install".

1.4.4 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.

ARTICLE 2 – OWNER

2.1 **LAND**

2.1.1 The Owner will provide the lands shown on the Drawings upon which the Work shall be performed. The Owner will provide a right-of-way for access to the project site.

2.1.2 The Owner will provide base lines for the location of the principle component parts of the Work with a suitable number of bench marks adjacent to the Work.

2.2 **RIGHT OF ENTRY BY OWNER**

2.2.1 The Owner and his authorized representative will have the right to enter the property or location on which the Work shall be constructed. The Owner further reserves the right to construct or have his authorized agents construct such work as the Owner will desire, so long as these operations do not interfere with or delay the work being constructed under this Contract.

2.3 **OWNER'S RIGHT TO CARRY OUT THE WORK**

2.3.1 If the Contractor defaults or neglects to perform the Work in accordance with the Contract Documents, including the requirements with respect to the schedule of completion, and fails after ten days written notice from the Owner to correct the deficiencies, the Owner may deduct the cost thereof from the payment then or thereafter due the Contractor.

ARTICLE 3 – CONTRACTOR

3.1 **GENERAL**

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

3.1.2 The Contractor shall furnish labor, materials, equipment, and transportation necessary for the proper execution of the work unless specifically noted otherwise. The Contractor shall do all the work shown on Drawings and described in Specifications and all incidental work considered necessary to complete the project in a substantial and acceptable manner, and to fully complete the work or improvement, ready for use, occupancy and operation by the Owner. Drawings and Specifications shall be interpreted by the Design Professional or the Owner if no Design Professional exists for the project.

3.1.3 The Contractor shall cooperate with the Owner, Design Professional, inspectors, and with other contractors on the Project. Contractor shall allow inspectors acting in an official capacity, to have access to the project site.

3.1.4 The Contractor shall determine that the final and completed work on the project is in accordance with the Contract Documents. The failure of the Design Professional to find or correct errors or omissions in the use of materials or work methods during the progress of the work shall not relieve the Contractor from his responsibility to correct all the defects in the project.

3.1.5 The Contractor shall assist in making final inspections and shall furnish such labor and equipment as may be required for the final tests of equipment, piping, and structures.

3.2 **REVIEW OF FIELD CONDITIONS**

3.2.1 Before ordering material or doing Work, the Contractor shall verify all measurements involved and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on Drawings; differences which may be found, shall be submitted to Design Professional for consideration before proceeding with the Work.

3.2.2 Drawings may show the location or existence of certain exposed and buried utilities as well as existing surface and subsurface structures. The Owner assumes no responsibility for failure to show any or all such utilities and structures on the Drawings or to show such in the exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for extra work or for

increasing the pay quantities in any manner unless the obstruction encountered necessitates substantial changes in the lines or grades or requires the building of a special structure.

3.3 **REVIEW OF CONTRACT DOCUMENTS**

3.3.1 The Contractor shall study and compare Drawings, Specifications, and other instructions and shall report to the Design Professional at once any error, inconsistency, or omission discovered.

3.3.2 In the event of conflict among the Contract Documents, interpretations will be based on the following order of precedence, stated highest to lowest:

a. The Agreement
b. This Division Zero (0) shall control in the event of conflict between this Division Zero (0) and other Divisions 1 through 16
c. Addenda to Drawings and Specifications with those of later date having precedence.
d. Drawings and Specifications

3.3.3 Since the Contract Documents are complementary, the Contractor shall take no advantage of any apparent error or omission in the Drawings and Specifications. The Owner or Design Professional shall furnish interpretations as deemed necessary for the fulfillment of the intent of the Drawings and Specifications.

3.3.4 Discrepancies found between the Drawings and Specifications and actual site conditions or any errors or omissions in the Drawings or Specifications shall be immediately reported to the Design Professional or in the case where a Design Professional is not on the Project, the Owner shall be notified, who shall address such error or omission in writing. Work done by the Contractor after discovery of such discrepancies, errors, or omissions shall be at the Contractor's risk and expense.

3.4 **REQUEST FOR SUPPLEMENTARY INFORMATION**

3.4.1 The Contractor shall make timely requests of the Owner or Design Professional for additional information required for the planning and production of the Work. Such requests shall be submitted as required, but shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Contractor understands and agrees that it is Contractor’s duty to determine the need for, and to request said additional information in writing from the Design Professional by such date as allows Design Professional to provide the information to the Contractor by a date that will not adversely affect Contractor’s ability to complete the Work by the date specified in the Contract.

3.4.2 Additional instructions may be issued by the Design Professional during the progress of the Work to clarify the Drawings and Specifications or as may be necessary to explain or illustrate changes in the Work.

3.5 **SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

3.5.1 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.

3.5.2 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.

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

3.5.4 The Contractor shall provide shop drawings and other submittals, settings, schedules, and other drawings as may be necessary for the prosecution of the Work in the shop and in the field as required by the Drawings, Specifications, or Design Professional instructions.

3.6 **LABOR AND MATERIALS**

3.6.1 Except as otherwise specifically stated in the Contract, the Contractor shall provide, but not be limited to, all materials, labor, tools, equipment, water, light, heating and cooling, power, transportation, superintendence, temporary construction of every nature, taxes legally collectible because of the work, and all other services and facilities of every nature whatsoever necessary to complete the Work in accordance with the Contract Documents in an orderly and efficient manner. The sequence of construction operations shall follow the schedule of construction as approved by the Design Professional. The Work shall not be discontinued by the Contractor without approval of the Design Professional. Should prosecution of the Work be discontinued for any reason, the Contractor shall notify the Design Professional at least twenty-four hours in advance of resuming the Work.

3.6.2 Materials and equipment furnished under this Contract will be subject to inspection by the Owner's authorized representative or by independent laboratories. Defective material, equipment, or workmanship may be rejected at any time before the acceptance of the Work even though the defective material, equipment, or workmanship may have been previously overlooked and estimated for payment. The Contractor shall replace defective equipment and material in accordance with the Contract Documents at no additional cost to the Owner.

3.6.3 The Contractor shall provide materials and supplies not subject to conditional sales agreements, or other agreement reserving unto the seller any right, title, or interest therein. All materials and supplies shall become the property of the Owner upon final acceptance of this Contract by the Owner.

3.6.4 If shop tests are to be conducted, the Contractor shall notify the Owner of such tests so a representative may witness tests, if desired.

3.6.5 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Design Professional, and in accordance with a Change Order.

3.7 **UNAUTHORIZED WORK**

3.7.1 Work done without lines and grades having been given or work done beyond the lines or not in conformity with the grades shown on the Drawings or as provided by the Owner, except as provided herein, and work completed without proper inspection and supervision or any extra or unclassified work completed without written authority and prior agreement shall be at the Contractor's risk. Such unauthorized work, at the option of the Design Professional, may not be measured and paid for and may be ordered removed at the Contractor's expense.

3.8 **SUPERINTENDENCE**

3.8.1 The Contractor shall supervise and direct the Work. The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for coordinating portions of the Work under the Contract.

3.8.2 The Contractor shall employ a qualified superintendent during the duration of the Project who is acceptable to the Owner and the Design Professional. The superintendent shall be maintained on the Project site and shall be present on the site at all times work is in progress. The superintendent shall be capable of reading and understanding the Drawings and Specifications and shall have full

authority to act in behalf of the Contractor. All directions and instructions given to the Superintendent shall be considered as given to the Contractor and shall be as binding as if given to the Contractor.

3.8.3 Workmanship shall be performed by workmen experienced in their trade and skilled and experienced for the class of work to which assigned. Any person, including supervisory personnel, who does not show and exhibit skill and proficiency in said work shall be removed by the Contractor and replaced by a competent and experienced workman.

3.8.4 The Contractor shall, at all times, be responsible for the conduct and discipline of his employees and all Subcontractors and their employees. Disorderly, incompetent or intemperate persons, or persons who commit any crimes or trespass on public or private property in the vicinity of the Work must not be allowed to continue working upon the project which the Contractor has with the State. Any superintendent, foreman or workman employed by the Contractor or a Subcontractor who unreasonably refuses or neglects to comply with the instructions of the Owner, Design Professional, or inspector, shall, at the written request of the Owner or Design Professional, be removed from the work site and shall not be allowed to work further on any portion of the work without the approval of the Owner.

3.8.5 The Contractor shall coordinate Work by the various trades to provide uniform and symmetrical layout and spacing of the exposed components which will affect the finished design and appearance. Where spacing and related locations are not specifically shown on Drawings or where in doubt, the Contractor shall consult the Design Professional prior to installation of that part of the Work.

3.9 **PERMITS, FEES, AND NOTICES**

3.9.1 The Contractor shall purchase and secure all applicable permits and licenses and give all notices necessary and incidental to the prosecution of the Work. However, in accordance with Ark. Code Ann. §22-9-213, public works construction projects conducted by the Owner, a state agency, are exempt from permit fees or inspection requirements of county or municipal ordinances.

3.9.2 When new construction under the Contract crosses highways, railroads, streets or utilities under the jurisdiction of the state, county, city, or other public agency, public utility, or private entity, the Contractor shall secure written permission from the proper authority before executing such new construction. A copy of this written permission shall be filed with the Owner before any work is completed. The Contractor shall furnish a release from the proper authority before final acceptance of the Work. Any bonds required for this Work shall be secured and paid for by the Contractor.

3.10 **SAMPLES AND TESTS**

3.10.1 The Contractor shall provide samples, materials, and equipment necessary or required for testing as outlined in the various sections of the Specifications or as directed by the Owner. The Contractor shall pay all costs for testing. Should materials, methods, or systems fail to meet specified standards, the Contractor shall pay all costs for additional testing as required by the Owner.
3.10.2 All tests shall be made by a laboratory approved by the Owner.

3.11 **LOCATION, GRADIENT, AND ALIGNMENT**

3.11.1 Based upon the site information provided by the Owner, the Contractor shall develop and make detailed surveys necessary for construction including slope stakes, batter boards, and other working points, lines and elevations.

3.11.2 The Contractor shall report any errors, inconsistencies, or omissions to the Design Professional as a request for information.

3.11.3 The Contractor shall preserve benchmarks, reference points and stakes, and in the case of destruction thereof by the Contractor, shall be responsible for damage or mistakes resulting from unnecessary loss or disturbance.

3.12 **LAND**

3.12.1 Additional land and access thereto not shown on Drawings that may be required for temporary construction facilities or for storage of materials shall be provided by the Contractor at his expense with no liability to the Owner. The Contractor shall confine his equipment and storage of materials and the operation of his workmen to those areas shown on the Drawings and described in the Specifications, and such additional areas which he may provide or secure as approved by the Owner.

3.12.2 The Contractor shall not enter upon private property for any purpose without first obtaining permission.

3.12.3 The Contractor shall be responsible for the preservation of and prevent damage or injury to all trees, monuments, and other public property along and adjacent to the street and right-of-way. The Contractor shall prevent damage to pipes, conduits and other underground structures, and shall protect from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location, and shall not remove monuments or property marks until directed.

3.13 **LIMITS OF WORK**

3.13.1 The Contractor shall conduct Work and operations so as to cause a minimum of inconvenience to the public. At any time when, in the opinion of the Owner or Design Professional, the Contractor is obstructing a larger portion of a road, street, or other public right-of-way than is necessary for the proper execution of the Work, the Design Professional may require the Contractor to finish the sections on which work is in progress before work is commenced on any new sections.

3.14 **WARRANTY**

3.14.1 The Contractor shall warrant that all Work, materials, and equipment furnished will be free from defects in design, materials, and workmanship and will give successful service under the conditions required. The warranty period for Work, materials, and equipment furnished by the Contractor shall be one year from the date of the written acceptance of the Work as stated in the Substantial Completion Form approved by the Contractor, Owner and the Design Professional, unless a longer period is agreed upon.

3.15 **PATENTS AND ROYALTIES**

3.15.1 If the Contractor is required or desires to use any design, device, material or process covered by letters, patent, or copyright, he shall provide for such use by suitable legal agreement with the patents or Owner. It is mutually understood and agreed that without exception the Contract Sum shall include all royalties or costs arising from patents, trademarks, and copyrights in any way involved in the Work. The Contractor and the surety shall defend, indemnify, and save harmless the Owner and all its officers, agents and employees from all suits, actions, or claims of any character, name and description brought for or on account of infringement or alleged infringement by reason of the use of any such patented design, device, material or process of any trademark or copyright used in connection with the Work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense, or damage which it may be obliged to pay by reason of any action or actions, suit or suits which may be commenced against the Owner for any such infringement or alleged infringement at any time during the prosecution or after the completion of the Work

contracted for herein. It is mutually agreed that the Owner may give written notice of any such suit to the Contractor, and thereafter, the Contractor shall attend to the defense of the same and save and keep harmless the Owner from all expense, counsel fees, cost liabilities, disbursements, recoveries, judgments, and executions in any manner growing out of, pertaining to, or connected therewith.

3.16 **CLEANING UP**

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

3.16.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

ARTICLE 4 -- ADMINISTRATION OF CONTRACT

4.1 **DESIGN PROFESSIONAL AUTHORITY**

4.1.1 The Design Professional will interpret the requirements of the Contract Documents and decide matters concerning performance thereunder on request of the Owner or Contractor.

4.1.2 The Design Professional will provide administration of the Contract as described in the Contract Documents and will be the Owner's representative. The Design Professional will decide any and all questions as to the acceptability of materials or equipment furnished, work performed, interpretation of the Drawings and Specifications, rate of progress of the Work, acceptability of the quality of workmanship provided, and other questions as to the fulfillment of the Contract by the Contractor.

4.1.3 The Design Professional will prepare all change orders on the form specified by the Owner. The Design Professional may authorize minor changes in the Work not involving adjustment in Contract Sum or extension of Contract Time and not inconsistent with the intent of the Contract Documents.

4.1.4 The Design Professional Design Professional and his authorized representatives and the Owner will have the right to enter the property or location on which the Work shall be constructed.

4.2 **CLAIMS**

4.2.1 Definition: A claim is a demand or assertion by one of the parties seeking adjustment, or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. The term includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims will be initiated by written notice. The responsibility to substantiate claims shall rest with the party making the claim.

4.2.2 Claims of the Contractor or the Owner: Claims regarding the Work of the Contract shall be referred initially to the Design Professional for a decision. The Design Professional will review claims, and 1) reject in whole or in part; 2) approve the claim; 3) suggest a compromise; 4) advise the parties that the Design Professional is unable to resolve the claim.

4.2.3 Claims for Concealed or Unknown Conditions: If new and unforeseen items of work are discovered, which cannot be covered by any item or combination of items for which there is a Contract Sum, then the Contractor shall notify the Design Professional as quickly as reasonably possible and shall not continue working on the discovered new or unforeseen items without express written permission from the Design Professional. The Contractor shall complete such work and

furnish such materials as may be required for the proper completion or construction of the work contemplated upon written Change Order from the Design Professional as approved by the Owner. Work shall be performed in accordance with the Contract Documents.

4.2.4 Claims for Extensions of Time: The Contractor shall provide written notice to Design Professional within ten days stating the cause of the delay and request an extension of Contract Time. The Design Professional will act on the request in writing. The extension of time shall be for a period equivalent to the time lost by reasons indicated. No extension of time shall be effective until included in a Change Order approved by the Owner and Design Professional.

4.2.5 Claims for Changes in the Work: The Contractor shall provide written notice to Design Professional within ten calendar days after the receipt of instructions from the Owner, as approved by the Design Professional, to proceed with changes in the Work and before such Work is commenced. Changes in the Work shall not be commenced before the claim for payment has been approved, except in emergencies endangering life or property. The Contractor's itemized estimate sheets showing labor and material shall be submitted to the Design Professional. The Owner's order (Change Order) for changes in the Work shall specify any extension of the Contract Time and one of the following methods of payment:

a. Unit prices or combinations of unit prices, which formed the basis of the original Contract.
b. A lump sum fee based on the Contractor's estimate, approved by the Design Professional and accepted by the Owner.
c. The actual cost of the Work plus an allowance of 12 percent and 5 percent for the General Contractor and Subcontractor, respectively.

4.2.6 Claims for Additional Costs: In case of an emergency which threatens loss or injury of property or safety of life, the Contractor shall be allowed to act, without previous instructions from the Design Professional, in a diligent manner. The Contractor shall notify the Design Professional immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted, but in no case more than 7 calendar days following the event causing the emergency, to the Design Professional for consideration. The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided under these General Conditions. No agreement to pay costs for additional work shall be effective until included in a Change Order approved by the Owner, Contractor and the Design Professional.

ARTICLE 5 – SUBCONTRACTORS

5.1 **ASSIGNMENT OF CONTRACT**

5.1.1 Neither the Owner nor the Contractor shall have the right to sublet, sell, transfer, assign, or otherwise dispose of the "Contract" or any portion thereof without written consent of the other party. No assignment, transfer, or subletting, even with the proper consent, shall relieve the Contractor of his liabilities under this Contract. Should any Assignee or Subcontractor fail to perform the work undertaken by him in a satisfactory manner, the Owner, has the right to annul and terminate the Assignee's or Subcontractor's contract on the project.

5.2 **SUBCONTRACTS**

5.2.1 The subcontracting of the whole or any part of the Work to be done under this Contract will not relieve the Contractor of his responsibility and obligations. All transactions of the Owner or Design Professional shall be with the Contractor. Subcontractors will be considered only in the capacity of employees or workmen and shall be subject to the same requirements as to character and competency.

5.2.2 The Contractor shall discharge or otherwise remove from the project any Subcontractor that the Owner or the Design Professional has reasonably determined as incompetent or unfit.

5.2.3 The Contractor may not change those Subcontractors listed on the proposal without the written approval of the Owner and Design Professional. The Contractor shall not be relieved of any liabilities under this Contract, but shall be fully responsible for any Subcontractor or work by said Subcontractor where Subcontractor is employed by the Contractor to perform work under this Contract. Nothing contained in the Contract Documents shall create contractual relations between any Subcontractor and the State.

5.2.4 No officer, agent, or employee of the Owner, including the Design Professional, shall have any power or authority to bind the Owner or incur any obligation in his behalf to any Subcontractor, material supplier or other person in any manner whatsoever.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OTHER CONTRACTS

6.1.1 The Owner reserves the right to award other contracts in connection with the Project. The Contractor shall cooperate with the other contractors with regard to the storage of materials and equipment, access to the site, and execution of their work. It shall be the Contractor's responsibility to inspect the work of other contractors which will affect the work of this Contract and to report to the Owner irregularities which will not permit him to complete his work in a satisfactory manner or in the time allotted. Failure to so report shall constitute an acceptance of the work of other contractors.

6.2 DEPENDENCE ON OTHERS

6.2.1 If any part of the Contractor's work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the work, promptly report to the Design Professional any apparent discrepancies or defects in such other work that render it suitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the work.

ARTICLE 7 -- CHANGES IN THE WORK

7.1 GENERAL

7.1.1 The Owner may, as the need arises, without invalidating the Contract, order changes in the work in the form of additions, deletions, or modifications. Compensation to the Contractor for additional work or to the Owner for deductions in the work and adjustments for the time of completion shall be adjusted at the time of ordering such change.

7.1.2 Additional work shall be done as ordered in writing by the Owner. The order shall state the location, character, and amount of extra work. All such work shall be executed under the conditions of the Contract, subject to the same inspections and tests.

7.1.3 The Design Professional and the Owner reserve and shall have the right to make changes in the Contract Documents and the character or quantity of the work as may be considered necessary or desirable to complete fully and acceptably the proposed construction in a satisfactory manner.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument, prepared by the Design Professional and approved by the Owner stating their agreement upon the following, separately or in any combination thereof:

a. Description and details of the work.
b. Amount of the adjustment in the Contract Sum.
c. Extent of the adjustment in the Contract Time.
d. Terms and conditions of the Contract Documents.

7.2.2 Change Order requests by the Contractor shall be submitted in a complete itemized breakdown, acceptable to the Owner and the Design Professional.

7.2.2.1 Where unit prices are stated in the Contract, Contractor should submit an itemized breakdown showing each unit price and quantities of any changes in the Contract Amount. The value of all such additions and deductions shall then be computed as set forth in Paragraph 7.2.2.3.

7.2.2.2 The Contractor shall present an itemized accounting together with appropriate supporting data for the purposes of considering additions or deductions to the Contract Amount. Supporting data shall include but is not limited to the following:

a. Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and worker or workmen's compensation insurance;
b. Cost of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
c. Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
d. Costs of premiums for all bonds and insurance, permit fees, and sales, use of similar taxes related to the Work; and
e. Additional costs of supervision and field office personnel directly attributable to the change.

The burden of proof of cost rests upon the Contractor. Contractor agrees that Owner or Owner's Representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and granting of such cost.

7.2.2.3 Compute requests for changes be they additions or deductions as follows:

a. For work performed by the Contract:

Net Cost of Materials	a
State Sales Tax	b
Net Placing Cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and Profit, 12% x (a+b+c+d)	e
Allowable Bond Premium	f
TOTAL COST	a+b+c+d+e+f

b. Credit for work deleted shall be computed as outlined in 7.2.2.3 a. through e., except the Contractor's share of overhead and profit percentage is seven percent.
c. For added work performed by Subcontractors: Subcontractors shall compute their work as outlined in 7.2.2.3 a. through e. To the cost of that portion of the work (Change) that is performed by the Subcontractor, the Contractor shall add an Overhead and Profit Change of five percent plus the Allowable Bond Premium.
d. For work deleted by a Subcontractor: Subcontractors shall compute their work as outlined in 7.2.2.3 a through e, except that the overhead and profit shall be seven percent and the Contractor's overhead and profit shall be five percent.

7.3 **PAYMENT FOR CHANGES IN THE WORK**

7.3.1 All changes in the Work will be paid for in the manner indicated in Article 4, Paragraph 4.2, and the compensation thus provided shall be accepted by the Contractor as payment in full for the use of small tools, superintendent's services, premium on bond, and all other overhead expenses incurred in the prosecution of such work.

7.3.2 The Owner shall not be deemed to have agreed to any costs for additional work, to have agreed to additional time for completion, or to have agreed to any other change in the terms and conditions of the Contract Documents until Owner, Design Professional and Contractor have executed a Change Order to this Contract. For any increases to the contract amount, scope of work, time for completion or other terms relating to the Change Order, the Contractor shall, if deemed necessary by Owner, furnish an amendment to the Bond agreement in which the Surety has agreed to amend the Performance and Payment Bond to reflect such revisions. When the Amendment is determined to be needed by Owner, Change Orders will not be processed without the attached Amendment to the Performance and Payment Bond. The Contractor is responsible for obtaining the bonding companies concurrence with the new contract amount, time for completion, or other terms related to the Change Order. As with the initial Bond Agreement, a Power of Attorney for the Arkansas Resident Agent must be attached. In addition, the Clerk of the County where the work is being performed must certify the Amendment as having been filed before payment is made.

ARTICLE 8 – TIME

8.1 **DEFINITIONS**

8.1.1 Contract Time is the period of time identified in the Contract Documents for Substantial Completion of the Work, including authorized adjustments made as part of Change Orders agreed to by the Owner, the Design Professional and the Contractor.

8.1.2 Date for commencement of the Work is the fifth calendar day following the date of mailing, by regular mail, of the Notice to Proceed, unless otherwise stated in the Contract.

8.1.3 Date of Substantial Completion is the date certified by the Design Professional and the Owner.

8.2 **PROGRESS**

8.2.1 Time limits identified in the Contract Documents are of the essence of the Contract. The Contractor confirms that the Contract Time is a reasonable period of time for performing the Work.

8.3 **HOLIDAYS**

8.3.1 New Year's Day, Robert E. Lee/Dr. Martin Luther King's Birthday, President’s Birthday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and the day thereafter, Christmas Eve and Christmas Day will be considered as being legal holidays; no other days will be considered unless declared by the Governor of the State of Arkansas through an Executive Order or Proclamation. No Design Professional clarifications, observations, or State inspections will be provided on legal holidays, Saturdays and Sundays, and no work shall be performed on these days except in an emergency or with written approval in advance by the Design Professional and Owner.

8.4 **DELAYS**

8.4.1 Delays beyond the Contractor's control occasioned by an act or omission on the part of the Owner, strikes, fires, additions to the work, delays by any separate contractor employed by the Owner, extremely abnormal weather conditions, or other delays beyond the Contractor’s control may, if agreed to by Change Order by the Contractor, Owner and Design Professional entitle the

Contractor to an extension of time in which to complete the work. While such delays may be just cause for an extension of the Contract Time, the Contractor shall not have a claim for damages for any such cause or delay.

ARTICLE 9 -- PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the Work and for performing all Work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the Work, from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the final acceptance by the Design Professional and Owner and for all risks of every description connected with the prosecution of the Work, for all expenses incurred in consequence of the suspension or discontinuance of the Work as specified, for any infringement of patent, trademark, or copyright, and for completing the Work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

9.1.2 No moneys payable under Contract or any part thereof, except the estimate for the first month or period, shall become due and payable if the Owner so elects until the Contractor shall satisfy the said Owner that he has fully settled or paid for all materials and equipment used in or on the Work and labor done in connection therewith, and the Owner, if he so elects, may pay any or all such bills wholly or in part and deduct the amount or amounts so paid from any monthly or final estimate excepting the first estimate.

9.1.3 In the event the surety on any contract or payment bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has the right to do business in a state revoked as provided by law, the Owner may at its election withhold payment of any estimate filed or approved by the Design Professional until the Contractor shall give a good and sufficient bond in lieu of the bond so executed by such surety. Any and all subsequent bonds shall be filed with the Circuit Clerk of the County in which the Work is being performed.

9.2 SCHEDULE OF VALUES

9.2.1 The Contractor shall submit to the Design Professional a schedule of values for each part of the Work. The schedule shall be a complete breakdown of labor and materials for the various parts of the Work including an allowance for profit and overhead. The total of these amounts shall equal the Contract Sum. The approved schedule of values shall be used as a basis for the monthly payments to the Contractor. In applying for the monthly payment, the Contractor shall show a detailed account of work accomplished in conformity with the schedule.

9.3 MEASUREMENT OF QUANTITIES

9.3.1 The Contractor shall be paid for all Work performed under the Contract based on Design Professional computations of as-built quantities and the Contractor's Contract Sum. This payment shall be full compensation for furnishing all supplies, materials, tools, equipment, transportation, and labor required to do the Work; for all loss or damage, because of the nature of the Work, from the action of the elements or from any unforeseen obstruction or difficulty which may be encountered in the prosecution of the Work and for which payment is not specifically provided for all or any part of the Work; and for well and faithfully completing the Work in accordance with the Contract Documents. The method of computation and payment for each item shall be as set forth in the Specifications or the Supplementary Conditions.

9.4 **REQUESTS FOR PAYMENT**

9.4.1 The Contractor may submit periodically, but not more often than once each month, a Request for Payment for work completed. When unit prices are specified in the Contract Documents, the Request for Payment shall be based on the quantities completed.

9.4.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, and if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner and the Design Professional to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.4.3 The Contractor shall furnish the Design Professional all reasonable facilities and job tickets required for obtaining the necessary information relative to the progress and execution of the Work and the measurement of quantities. Each Request for Payment shall be computed from the work completed on all items listed in the approved schedule of values less 10 percent of the first 50 percent of the adjusted Contract Sum and less previous payments to the Contractor on the Contract.

9.5 **PERIODIC ESTIMATES FOR PAYMENT**

9.5.1 Unless otherwise stated in the Specifications or Supplementary Conditions, the Owner shall cause the Design Professional to prepare an Estimate for Payment to the Contractor each month. The Design Professional will make the estimate for the materials complete in place and the amount of work performed in accordance with the Contract between the twenty-fifth day of the month and the fifth day of the succeeding month.

9.5.2 From the total of the amount estimated to be paid, an amount equal to 10 percent of the total completed shall be retained until the Contract is 50 percent complete after which no further retainage will be withheld from the monthly estimates. All sums withheld by the Owner and requested in a Final Pay Request prepared by the Contractor will be paid to the Contractor within 30 days after the Contract has been completed and the work approved by the Owner and the Design Professional. No retainage will be withheld on that amount of the progress payment pertaining to the cost of materials stored at the site or within a bonded warehouse.

9.6 **PAYMENT FOR INCREASED OR DECREASED QUANTITIES**

9.6.1 When alterations in the quantities of work not requiring Contract modifications are ordered and performed, the Contractor shall accept payment in full at the Contract Sum, for the actual quantities of work accomplished. No allowance will be made for anticipated profits. Increased or decreased work involving Contract modifications shall be paid for as stipulated in such Contract modifications

9.7 **DESIGN PROFESSIONAL'S ACTION ON A REQUEST FOR PAYMENT** (See also 9.9)

9.7.1 The Owner shall cause the Design Professional to, within five working days plus time required for transmittal from one party to another, act on a Request for Payment by the Contractor in one of the following:

a. Approve the Request for Payment as submitted by the Contractor, and transmit same to the Owner.

b. Approve an adjusted amount as the Design Professional will decide is due the Contractor informing the Contractor in writing of the reason for the adjusted amount, and transmit same to the Owner.
c. Withhold the Request for Payment submitted by the Contractor informing the Contractor and the Owner in writing of the reason for withholding the request.

9.8 **OWNER'S ACTION ON A REQUEST FOR PAYMENT** (See also 9.9)

9.8.1 The Owner will, within ten working days plus transmittal time between the various state agencies involved, act on a Request for Payment after approval by the Design Professional by one of the following:

a. Approve the Request for Payment as approved by the Design Professional, and forward the Pay Request to the Owner's Contract Administrator in Finance for review and approval prior to submission to Owner's Accounts Payable for payment.
b. Approve payment of an adjusted amount as the Owner will decide is due the Contractor, informing the Contractor and the Design Professional in writing of the reason for the adjusted amount of payment.
c. Withhold the Request for Payment informing the Contractor and the Design Professional in writing of the reason for withholding the payment.

9.9 **ARKANSAS STATE AGENCIES ACTION ON A REQUEST FOR PAYMENT**

9.9.1 The State shall process payments in accordance with Ark. Code Ann. §19-4-1411, or as modified by subsequent law, which establishes the time limits for the Design Professional, the Owner and the Department of Finance and Administration. It also authorizes the Chief Fiscal Officer of the State to investigate any complaints of late payments and assess penalties for late payment. Complaints shall be addresses to "Chief Fiscal Officer of the State: Department of Finance and Administration; 1509 West Seventh Street, Suite 401; Post Office Box 3278; Little Rock, AR 72203-3278.

9.10 **WITHHOLDING PAYMENT**

9.10.1 The Design Professional or the Owner may withhold payment for contested issues, including but not limited to, defective work on the project; evidence indicating the probable filing of claims by other parties against the Contractor related to the project; damage caused to another contractor; reasonable evidence that Work cannot be completed for the unpaid balance of the Contract Sum or within Contract Time or failure of the Contractor to make payments on materials, equipment or labor to subcontractors. It is the responsibility of the contesting party to notify the Contractor in writing that payment has been contested and the reasons why. The notification must be done within the timeframe specified for processing of payment under Ark. Code Ann. §19-4-1411.

9.11 **PAYMENT FOR UNCORRECTED WORK**

9.11.1 Should the Design Professional direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the Contract Documents, an equitable deduction from the Contract Sum shall be made to compensate the Owner for the uncorrected work. The Design Professional shall determine the amount of the equitable deduction.

9.12 **PAYMENT FOR REJECTED MATERIALS AND WORK**

9.12.1 The removal of rejected Work and materials and the re-execution of acceptable work by the Contractor shall be at the expense of the Contractor. The Contractor shall pay the cost of replacing the work of other contractors destroyed or damaged by the removal of the rejected work or materials and the subsequent replacement with acceptable work.

9.13 **DATE OF SUBSTANTIAL COMPLETION**

9.13.1 A Certificate of Substantial Completion, which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to work, and insurance and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion, unless another timeframe is stated in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall not become effective until approved by the Owner and the Design Professional.

9.14 **FINAL COMPLETION AND PAYMENT BY OWNER**

9.14.1 The Contractor shall furnish a letter from the Design Professional attached to the Contractor's final estimate, which shall include all retainage withheld, certifying that the Design Professional has received and approved all guarantees, bonds, maintenance and operation manuals, air balance data, shop drawings, catalog data, and record documents specified in the Contract Documents.

9.14.2 Before final payment, the Contractor shall furnish to the Design Professional executed copies of the Release of Claims and Consent of the Performance and Payment Bond Surety for Final Payment. Items listed in this Section Nine (9) shall be submitted with and at the same time as the final estimate to the Design Professional and shall be promptly delivered by the Design Professional to the Owner. No final payment or release of retained amounts shall be made without complete compliance with this Section Nine (9), and approval by the Owner of the Final Pay Request, which shall include payment of all retained amounts,

9.14.3 Any claim by the Contractor to the Owner for interest on a delinquent final payment shall only be made pursuant to Ark. Code Ann. § 22-9-205.

9.15 **PARTIAL OCCUPANCY OR USE**

9.15.1 The Owner may occupy or use any completed or partially completed portion of the Work provided such use or occupancy is consented to by the insurer and authorized. The Contractor will prepare a list of items to be completed or corrected before partial acceptance. Upon receipt of the Contractor's list, the Design Professional will make an inspection to determine whether the Work or portion thereof is substantially complete. No portion of the work shall be considered substantially complete unless described in a Certificate of Substantial Completion Form approved by the Contractor, Owner and the Design Professional.

9.15.2 The Design Professional will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to Work and insurance, identify work items to be corrected or completed by the contractor and shall fixing the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion, unless another timeframe is stated in the Certificate of Substantial Completion. No retained amounts shall be paid until the Contractor, Design Professional and the Owner approve a Certificate of Substantial Completion for all of the Work unless specifically provided for by this contract, and all other conditions for final acceptance of this Work are met to the satisfaction of the Owner.

9.15.3 Instances where some of the Work is "sectioned" out and substantially completed, the retained amounts shall not be paid until the final Certificate of Substantial Completion of the entire Work is approved by the Contractor, Design Professional, and the Owner and all other conditions of this Section Nine (9) are met by the Contractor.

9.16 **FINAL INSPECTION**

9.16.1 Tests, inspections, and approvals of portions of the Work required by the Contract Documents, laws, ordinances, or any public authority having jurisdiction shall be made at the appropriate time. The Contractor shall give the Design Professional timely notice of when and where tests and inspections shall be made so that the Design Professional may be present. The Contractor shall make arrangements for the testing and inspection with an independent testing laboratory.
9.16.2 The Contractor shall ensure that the final completed work is in accordance with the Contract Documents. Required certificates of testing and inspection shall be secured by the Contractor and delivered to the Design Professional, unless otherwise required by the Contract Documents.

9.17 **ASSIGNMENT OF WARRANTIES**

9.17.1 All warranties of materials and workmanship running in favor of the Contractor shall be transferred and assigned to the Owner on completion of the Work and at such time as the Contractor receives final payment.

9.17.2 In case of warranties covering work performed by subcontractors, such warranties shall be addressed to and in favor of the Owner. The Contractor shall be responsible for delivery of such warranties to the Owner prior to final acceptance of the work.

9.17.3 Delivery of guarantees or warranties shall not relieve the Contractor from any obligation assumed under any provision of the Contract. All warranties shall be for one year from the date of Substantial Completion of the Project, unless extended otherwise.

9.18 **ACCEPTANCE AND FINAL PAYMENT**

9.18.1 Upon receipt of written notice that the Work is ready for final inspection, the Design Professional together with the Owner will conduct such inspection and when the Design Professional determines the work is acceptable to the Design Professional and the Owner, the Design Professional shall certify his acceptance to the Owner. Final Payment shall be the Contract Sum plus approved Change Order additions less approved Change Order deductions and less previous payments made. The Contractor shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the Work. The Owner, upon approval by the Design Professional of all documentation to be provided by the contractor in accordance with this Section 9, and approval by the Design Professional, Contractor and Owner of the Certificate of Substantial Completion will accept the Work and release the Contractor, except as to the conditions of the Performance and Maintenance Bond, any legal rights of the Owner, required guarantees and correction of faulty work after Final Payment, and shall authorize payment of the Contractor's final Request for Payment. The Contractor must allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the Design Professional to assemble and check the necessary data.

9.18.2 Acceptance of final payment by the Contractor shall constitute waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Request for Payment. Any claims for interest on delinquent payments shall be made pursuant to Ark. Code Ann.§ 22-9-205.

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

10.1 **GENERAL**

10.1.1 The Contractor shall at all times exercise precaution for the safety of employees on the Project and of the public, and shall comply with all applicable provisions of federal, state and municipal safety laws and applicable building and construction codes. The Contractor shall provide and maintain

passageways, guard fences, lights, and other facilities for protection required by all applicable laws. All machinery, equipment, and other physical hazards shall be guarded in accordance with all federal, state or municipal laws or regulations.

10.1.2 The Work, from commencement to completion, and until written acceptance by the Design Professional, and the Owner or to such earlier date or dates when the Owner may take possession and control in accordance with Section Nine (9) of these General Conditions, shall be under the charge and control of the Contractor and during such period of control by the Contractor, all risks in connection therewith shall be borne by the Contractor. The Contractor shall make good and fully repair all damages to the Project by reason of the Contractor's negligence, and make good on all injuries to persons caused by any casualty or cause by reason of the Contractor's negligence. The Contractor shall adequately protect adjacent Property as provided by law and the Contract Documents. The Contractor shall hold the Owner harmless from any and all claims for injuries to persons or for damage to property during the control by the Contractor of the project or any part thereof.

10.1.3 The Contractor shall at all times so conduct the Work as to ensure the least possible obstruction to traffic, to the general public, and the residents in the vicinity of the Work, and to ensure the protection of persons and property. No road, street, or highway shall be closed to the public except with the permission of the Owner and proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to fire fighting equipment at all times. The local fire department shall be notified of the temporary closing of any street.

ARTICLE 11 -- INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall secure and maintain in force during this Contract such insurance as is specified within the Contact Documents, from an insurance company authorized to write the prescribed insurance in the jurisdiction where the Project is located as will protect the Contractor, his subcontractors, and the Owner from claims for bodily injury, death, or property damage which may arise from operations under this Contract. The Contractor shall not commence work under this Contract until he has obtained all the insurance required, has filed the Certificate of Insurance with the Owner, and the certificate has been approved by the Owner. Each insurance policy shall contain a clause providing that it shall not be canceled by the insurance company without written notice to the Owner of intention to cancel.

11.1.2 Workman's Compensation and Employer's Liability Insurance in statutory limits shall be secured and maintained as required by the laws of the State of Arkansas. This insurance shall cover all employees who have performed any of the obligations assumed by the Contractor under these Contract Documents including Employer's Liability Insurance. This insurance shall protect the Contractor against any and all claims resulting from injuries, sickness, disease, or death to employees engaged in work under this Contract.

11.1.3 Comprehensive General Liability Insurance, including automobile and truck liability. Prior to blasting, the Contractor shall furnish Certificate of Insurance, which shall certify that damage caused by blasting is within the coverage of his Comprehensive General Liability Insurance to the full limits thereof. Hired and non owned automobile insurance for automobiles and trucks shall include hired and non owned automobile coverage.

11.1.4 Contractor's Protective Liability Insurance: The Contractor shall indemnify and save harmless the Owner from and against all losses and all suits, claims, demands, judgments, actions, and payments of every description and nature brought or recovered against him by reason of any omission or act of the Contractor, his agents, or employees in the execution of the Work or in the guarding of it. The

Contractor shall secure and maintain protective liability insurance in the name of the Owner and the Contractor covering them from contingent liability under this Contract.

11.1.5 Builder's Risk and Fire Insurance: The Contractor shall procure and maintain during the life of this Contract Builder's Risk Insurance fire, lightning, extended coverage, vandalism, and property theft on the insurable portion of the Project on a 100 percent completed value basis against damage to the equipment, structures, or material. The Owner and the Contractor, as their interests may appear, shall be named as the Insured.

11.1.6 Proof of Insurance: The Contractor shall maintain the insurance coverages required by this contract **(see Supplemental Conditions for required coverages)** throughout the term of this contract, and shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled, or materially altered except after 15 days prior written notice has been received by the Owner."

11.2 **BONDS**

11.2.1 Performance and Payment Bond: The Contractor shall, at the time of execution of the Contract, furnish bonds covering faithful performance of the Contract and the payment of obligations. Performance and Payment bonds, and any amendments thereto, shall be filed with the circuit clerk office in the County Courthouse of the county where the work shall be performed. For any increases to the contract amount, scope of work, time for completion or other terms relating to the Change Order, the Contractor may be required by Owner to furnish an amendment to the Bond agreement in which the Surety has agreed to amend the Performance and Payment Bond to reflect such revisions. As with the initial Bond Agreement, a Power of Attorney for the Arkansas Resident Agent must be attached. In addition, the Clerk of the County where the work is being performed must certify the Amendment as having been filed before payment is made.

ARTICLE 12 -- UNCOVERING AND CORRECTION OF WORK

12.1 **EXAMINATION OF COMPLETED WORK**

12.1.1 If any portion of the work should be covered contrary to the request of the Owner, Design Professional, or Inspector or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, Design Professional, or Inspector, be uncovered for his observation and replaced at the Contractor's expense.

12.2 **DEFECTIVE WORK**

12.2.1 Defective work, whether through the use of defective materials, the result of poor workmanship, or any other cause, shall be removed within ten days after notice is given by the Owner or Design Professional. The Work and affected materials and equipment shall be removed and replaced as necessary to comply with the Contract Documents without additional cost to the Owner. The fact that the defective work may have been previously overlooked by the Design Professional shall not constitute acceptance.

12.3 **REJECTED MATERIALS**

12.3.1 Materials which do not conform to the requirements of the Contract Documents, are not equal to samples approved by the Design Professional, or are in any way unsuited or unsatisfactory for the purpose for which intended, shall be rejected. Defective materials shall be removed within ten days after notice by the Design Professional. The materials shall be replaced with new materials as necessary to comply with the Contract Documents at no additional cost to the Owner. The fact that

the defective material may have been previously overlooked by the Design Professional shall not constitute acceptance.

12.3.2 Should the Contractor fail to remove and replace rejected material within the specified ten days after written notice to do so, the Owner may remove and replace the material and deduct the cost from the Contract Sum.

12.4 **CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT**

12.4.1 The approval of the final Contractor's Request for Payment by the Design Professional and the making of the final payment by the Owner to the Contractor shall not relieve the Contractor of responsibility to correct faulty materials or workmanship promptly after receipt of written notice from the Owner. The Owner shall give such notice of faulty materials or workmanship promptly, after discovery of the condition. If the Contractor fails to correct the defects, promptly, after receipt of written notice from Owner, the Owner may have the work corrected at the Contractor's expense.

ARTICLE 13 -- MISCELLANEOUS PROVISIONS

13.1 **GOVERNING LAW**

13.1.1 The Contract shall be governed by the laws and regulations of the STATE OF ARKANSAS. Venue for any administrative action or judicial proceedings shall be Pulaski County, Arkansas. Nothing in these General Conditions shall be construed to waive the sovereign immunity of the STATE OF ARKANSAS or any entities thereof.

13.1.2 The Contractor shall give all notices and comply with all federal, state, and local laws, ordinances, and regulations in any manner affecting the conduct of the Work. The Contractor shall indemnify and save harmless the Owner against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by himself or his employees.

13.1.3 The Contractor shall comply with the laws of the local, state, and federal government regarding wages and hours of labor.

13.2 **WRITTEN NOTICE**

13.2.1 Consider as served when delivered in person or sent by certified or registered mail to the individual, firm, or corporation or to the last business address of such known to him who serves the notice.

13.2.2 The written Notice to Proceed with the Work shall be issued by the Design Professional after the execution of the Contract by the Owner. The Contractor shall begin and prosecute the Work and uninterruptedly in a manner that will complete the Work within the time limits stated in the Contract.

13.3 **TESTS AND INSPECTIONS**

13.3.1 All materials and each and every part of the Work shall be subject at all times to inspection by the Owner, Design Professional, or the Inspector. The Contractor shall be held to the intent of the Contract Documents in regard to quality of materials, equipment, and workmanship, and the diligent execution of the Contract. The inspection may extend to and include plant, shop, or factory inspection of material furnished. The Contractor agrees to allow Federal or State inspectors, acting in an official capacity, to have access to the job site.

13.3.2 The Owner, Design Professional, and Inspectors shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection for ascertaining if the Work as performed is in accordance with the requirements and the Contract Documents.

13.3.3 Inspectors shall only have authority to suspend any work in a life threatening situation which is being improperly done, subject to the final decision of the Owner or Design Professional. Inspectors shall have no authority to permit deviations, or to relax provisions of the Contract Documents without the written permission or instruction of the Owner and the Design Professional, or delay the Contractor by failing to work with reasonable promptness.

13.4 **VERBAL AGREEMENTS**

13.4.1 No verbal objection, order, claim, or notice by any of the parties involved to the other parties shall affect or modify any of the terms or obligations contained in the Contract Documents. None of the terms or provisions of the Contract Documents shall be considered waived or modified unless the waiver or modification thereof is in writing, and agreed upon by the parties in the form of a Change Order approved by the Owner, Design Professional and the Contractor and no evidence shall be introduced in any proceeding of any other waiver or modification.

ARTICLE 14 -- TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 **SUSPENSION OF WORK**

14.1.1 The work or any portion thereof may be suspended at any time by the Owner provided that the Owner gives the Contractor written notice of the suspension. The notice shall set forth the date on which the work is to be suspended and the date on which the work is to be resumed. The Contractor shall resume the work upon written notice from the Owner within ten days after the date set forth in the notice of suspension.

14.1.2 The Owner will have the authority to suspend the work, wholly or in part, for such period of time as deemed necessary. The suspension may be due to unsuitable weather, or such other conditions as are considered unfavorable for the proper prosecution of the work, or the failure on the part of the Contractor to fulfill the provisions of the Contract. Failure to supply material, equipment, or workmanship meeting the requirements of the Contract Documents shall be just cause for suspension of the Work. The Contractor shall not have the right to suspend operations without the Design Professional or Owner's permission.

14.2 **TERMINATION BY OWNER FOR CAUSE**

14.2.1 The Owner will have the right to terminate the Contract upon giving ten days written notice of the termination to the Contractor and the Contractor’s surety, in the event of any default by the Contractor and upon written notice from the Design Professional to the Owner that sufficient cause exists to justify such action. In the event of termination of the Contract, the Owner may take possession of the Work and of all materials, tools, and equipment and construction equipment and machinery thereon and may finish the work by whatever method he may select. If the Owner does not elect to use his own forces, the surety shall furnish a competent licensed contractor within 10 working days from the written notice to the surety.

14.2.2 It shall be considered a default by the Contractor whenever he shall become insolvent; declare bankruptcy assigns assets for the benefit of his creditors; fails to provide qualified superintendence, proper materials, competent subcontractors, competent workmen; fails to make prompt payments for labor, materials, or equipment; disregards or violates provisions of the Contract Documents; disregards the Owner’s or the Design Professional’s instructions; fails to prosecute the Work according to the approved schedule of completion, including extensions thereof as provided for by

approved Change Orders; and fails to start the Work on the date established in the Notice to Proceed.

ARTICLE 15 – ALTERNATIVE DISPUTE RESOLUTION

15.1 MEDIATION

15.1.1 In the event of any dispute regarding the Contractor, Architect, Engineer, and/or Owner (hereinafter referred to as party/parties for this section only) under this Agreement, the party shall notify the appropriate Owner's Administrator in writing. The Owner's Administrator or his designee will then attempt to negotiate a settlement of the dispute between the parties.

15.1.2 If the Owner's Administrator, or designee, determines he is unable to negotiate a settlement between the parties, the parties may participate in mediation. A request for mediation must be made in writing to the Owner and the parties shall agree upon the location of the mediation. A Mediator mutually agreed upon by the parties shall conduct the mediation process. Mediation shall be voluntary, non-binding and all proceedings in connection with such shall be subject to this Agreement and applicable provisions of Arkansas law. Any mediation fees shall be borne equally between the parties. The parties shall coordinate mediation and the Owner shall notify the University of Arkansas System Office of any mediation prior to it taking place. The Owner's Administrator or his designee may view any and all mediation proceedings. Any settlements arising out of the mediation process must be approved by the University of Arkansas System Office.

15.1.3 Notwithstanding anything to the contrary contained herein, if any dispute arises between the Parties, whether or not it requires at any time the use of dispute resolution procedures described above, in no event, nor for any reason, shall the Contractor, Architect, or Engineer interrupt the provision of services/performance to the Owner, or perform any other action that prevents, slows down, or reduces, in any way, the provisions of the Agreement unless: (a) authority to do so is granted by the Owner or (b) the Agreement has been terminated by the Owner. Nothing in these contract documents, including the use of mediation, shall be construed to waive the sovereign immunity of the State of Arkansas or any entities thereof.

END OF DOCUMENT

AIA® Document A201® – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
UACCB Gateway FARM
Batesville, Arkansas

THE OWNER:
(Name, legal status and address)
The Board of Trustees of the University of Arkansas acting for and on the behalf of the University of Arkansas Community College at Batesville

THE ARCHITECT:
(Name, legal status and address)
Fennell Purifoy Architects, PLC
100 River Bluff Drive, Suite 320
Little Rock, AR 72202

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

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

TABLE OF ARTICLES

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(Topics and numbers in bold are section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

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

§ 1.1.2 THE CONTRACT

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

§ 1.1.3 THE WORK

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

§ 1.1.4 THE PROJECT

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

§ 1.1.5 THE DRAWINGS

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

§ 1.1.6 THE SPECIFICATIONS

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

§ 1.1.7 INSTRUMENTS OF SERVICE

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

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 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.

§ 1.2.2 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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, Building information modeling and digital data exhibit, or other standards prescribed by the Owner to establish the protocols for the development, use, transmission, and exchange of digital data.

ARTICLE 2 OWNER

§ 2.1 GENERAL

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

(Paragraph deleted)

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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 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.

§ 2.4 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 written 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. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, The Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed by the State of Arkansas. The Contractor shall be lawfully licensed by the State of Arkansas. . 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 obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

§ 3.4 LABOR AND MATERIALS

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

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

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

§ 3.4.4 The Contractor and Subcontractors shall comply with labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and with other laws, ordinances, and legal requirements applicable to the performance of the Work.

§ 3.4.5 The Work shall be performed in accordance with the Contract Documents by workers skilled and, when required, licensed in their respective trades.

§ 3.5 WARRANTY

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

§ 3.6 TAXES

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

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

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

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

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

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall

continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 SUPERINTENDENT

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

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

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required

submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written 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. 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 cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop

Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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 Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

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

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

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

§ 3.16 ACCESS TO WORK

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

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

§ 3.18 INDEMNIFICATION

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

party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The 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.

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

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

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

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

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed.

However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

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

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

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

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

§ 5.3 SUBCONTRACTUAL RELATIONS

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

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; 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 such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

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

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

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

§ 6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

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

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

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

§ 7.2 CHANGE ORDERS

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

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

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.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 related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

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

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

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

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

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

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

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material 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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

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

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a separate contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

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

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers 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 Architect 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, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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

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

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

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

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

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

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

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed 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 surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

§ 10.2.3 The Contractor shall 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 owners and users of adjacent sites and utilities.

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

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in

whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such 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. 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 report the condition to the Owner and Architect in writing.

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

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify 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 LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional

insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an 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 written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 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, whether completed or partially completed, of the Owner or separate contractors 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 except that, 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

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

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

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

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

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

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

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

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

§ 14.4.2 Upon receipt of written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must 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 CONTINUING CONTRACT PERFORMANCE

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

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

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

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 15.1.6 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 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. 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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

Additions and Deletions Report for
AIA® Document A201® – 2007

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

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 09:53:41 ET on 04/17/2025.

PAGE 1

UACCB Gateway FARM
Batesville, Arkansas

...

The Board of Trustees of the University of Arkansas acting for and on the behalf of the University of Arkansas Community College at Batesville

...

(Name, legal status and address)
Fennell Purifoy Architects, PLC
100 River Bluff Drive, Suite 320
Little Rock, AR 72202
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8.3.1, ~~11.3.10, 13.1,~~ 15.3.2, **15.4**
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3.17, **3.18**, 9.10.2, 10.3.3, ~~10.3.5, 10.3.6, 11.3.1.2, 11.3.7~~11.3

...

Insurance, ~~Loss of Use~~
~~11.3.3~~
~~Insurance,~~ Owner's Liability

...

10.2.5, **~~11.3~~11.3, 11.5**
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~~2.1.2,~~ **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3

...

2.2.1, 13.2.2, 14.1.1.4
~~Owner's Liability Insurance~~
~~11.2~~
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~~If the parties intend to transmit~~ The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital ~~form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.~~form. The parties will use AIA Document E203, Building information modeling and digital data exhibit, or other standards prescribed by the Owner to establish the protocols for the development, use, transmission, and exchange of digital data.

...

§ 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.~~

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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 written 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 ~~deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor~~ default or neglect. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, ~~neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor~~ 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.

...

§ 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.~~ licensed by the State of Arkansas. The Contractor shall be lawfully licensed by the State of Arkansas. . 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.

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§ 3.4.4 The Contractor and Subcontractors shall comply with labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and with other laws, ordinances, and legal requirements applicable to the performance of the Work.

§ 3.4.5 The Work shall be performed in accordance with the Contract Documents by workers skilled and, when required, licensed in their respective trades.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Phil Purifoy, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:53:41 ET on 04/17/2025 under Order No. 4104244172 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

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

UACCB Gateway FARM
Batesville, Arkansas

THE OWNER:
(Name, legal status and address)

The Board of Trustees of the University of Arkansas acting for and on behalf of the University of Arkansas Community College at Batesville

THE CONTRACTOR:
(Name, legal status and address)

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

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

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach,

including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than ($) each occurrence, ($) general aggregate, and ($) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than Two Million Dollars and Zero Cents ($ 2,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00) each employee, and One Million Dollars and Zero Cents ($ 1,000.000.00) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than Five Million Dollars and Zero Cents ($ 5,000,000.00) per claim and Five Million and Zero Cents ($ 5,000,000.00) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[X] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[X] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	100% of Contract Sum
Performance Bond	100% of Contract Sum

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

Additions and Deletions Report for

AIA® Document A101® – 2017 Exhibit A

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

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 09:54:09 ET on 04/17/2025.

PAGE 1

UACCB Gateway FARM
Batesville, Arkansas

...

The Board of Trustees of the University of Arkansas acting for and on behalf of the University of Arkansas Community College at Batesville
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§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than Two Million Dollars and Zero Cents ($ 2,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

...

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars and Zero Cents ($ 1,000,000.00) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00) each employee, and One Million Dollars and Zero Cents ($ 1,000.000.00) policy limit.

...

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than Five Million Dollars and Zero Cents ($ 5,000,000.00) per claim and Five Million and Zero Cents ($ 5,000,000.00) in the aggregate.
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[X] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

...

[X] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

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Payment Bond	100% of Contract Sum
Performance Bond	100% of Contract Sum

AIA® Document A201® – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
UACCB Gateway FARM
Batesville, Arkansas

THE OWNER:
(Name, legal status and address)
The Board of Trustees of the University of Arkansas acting for and on the behalf of the University of Arkansas Community College at Batesville

THE ARCHITECT:
(Name, legal status and address)
Fennell Purifoy Architects, PLC
100 River Bluff Drive, Suite 320
Little Rock, AR 72202

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

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

TABLE OF ARTICLES

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

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

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

§ 1.1.2 THE CONTRACT

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

§ 1.1.3 THE WORK

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

§ 1.1.4 THE PROJECT

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

§ 1.1.5 THE DRAWINGS

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

§ 1.1.6 THE SPECIFICATIONS

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

§ 1.1.7 INSTRUMENTS OF SERVICE

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

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 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.

§ 1.2.2 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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, Building information modeling and digital data exhibit, or other standards prescribed by the Owner to establish the protocols for the development, use, transmission, and exchange of digital data.

ARTICLE 2 OWNER

§ 2.1 GENERAL

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

(Paragraph deleted)

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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 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.

§ 2.4 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 written 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. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, The Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed by the State of Arkansas. The Contractor shall be lawfully licensed by the State of Arkansas. . 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 obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

§ 3.4 LABOR AND MATERIALS

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

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

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

§ 3.4.4 The Contractor and Subcontractors shall comply with labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and with other laws, ordinances, and legal requirements applicable to the performance of the Work.

§ 3.4.5 The Work shall be performed in accordance with the Contract Documents by workers skilled and, when required, licensed in their respective trades.

§ 3.5 WARRANTY

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

§ 3.5.1 The Contractor shall guarantee and warrant its work and materials, and the work and materials of its subcontractors, for a period of one year from the date of Substantial Completion of the Work. The Warranty shall be for a longer period on certain items so designated in the specifications. The foregoing one-year guarantee and warranty shall not in any way limit, restrict, or affect the liability of Contractor or its subcontractors for indemnity as provided for in the Construction Documents, nor shall it in any way Shorten the period of limitation fixed by law for filing of any action against Contractor for enforcement or for the breach of any provisions of any Contract Document. Should Contractor elect to use any of the equipment in the building during construction period, Contractor shall make arrangements with the equipment supplier for any of the equipment in the building during construction period, Contractor shall make arrangements with the equipment supplier for any available extension of warranty of that equipment made necessary by such use.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not such tax was effective at that time.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. Under Arkansas law the Owner, a state agency, is exempt from permit fees or inspections requirements of county or municipal ordianances.

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

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

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are

not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

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

§ 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 SUPERINTENDENT

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

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

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor within ten (10) days after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor within ten (10) days after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to

submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written 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. 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 cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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 Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

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

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

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

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner, Architect, and Owner's other consultants access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

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

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

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

(Paragraph deleted)

§ 4.1.1 The Architect is the person or entity retained by Owner pursuant to Section 2.3.2 and identified as such in the Agreement. The term Architect means Architect or Architect's authorized representatives and shall include by definition "Architect/Engineer," "Design Professional" and "Engineer" if these terms occur in the Contract Documents. .

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

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

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

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

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

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

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

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

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

§ 5.2.5 Where an of the provisions of this Article 5 conflict with the requirements of Arkansas law, including without limitation section 22-9-204 of the Arkansas Code, Arkansas law shall govern.

§ 5.3 SUBCONTRACTUAL RELATIONS

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

Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; 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 such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

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

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

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

§ 6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

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

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

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

§ 7.2 CHANGE ORDERS

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

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

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. The Contractor shall bear the burden of proving the necessity and the cost of a Change Order requested by the Contractor. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Net 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 related to the Work; and

.5 Net Placing cost.

For work performed by Contractor:

Net cost of materials	a
State sales tax	b
Net placing cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and profit %	
Multiplied by (a+b+c+d)	e
Allowable bond premium	f
CONTRACTOR ADJUSTMENT=a+b+c+d+f	

For work performed by Subcontractors:

Net cost of materials	a
State sales tax	b
Net placing cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and profit %	
Multiplied by (a+b+c+d)	e
Allowable bond premium	f
SUBCONTRACTORS ADJUSTEMENT= a+b+c+d+f	

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

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

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

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

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

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

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material 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, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

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

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests

and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a separate contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

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

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers 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 Architect 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, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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

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

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

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

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

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

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

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5) documentation of any special warranties, such as manufacturer's warranties or specific Subcontractor warranties and other close out documentation required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed 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 surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

§ 10.2.3 The Contractor shall 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 owners and users of adjacent sites and utilities.

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

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

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

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

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such 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.

§ 10.2.9 CONTROLLING EMPLOYER

As between Owner and Contractor. Contractor is responsible to the Owner for any and all safety measures and issues relating to the Work on the Project. Contractor shall administer and manage the safety program for the Work. This will include but not necessarily be limited to, review of the safety programs of each of Contractor's, Subcontractors, Contractor shall monitor the establishment and execution of effective safety practices then known to the industry as applicable to the Work, and the compliance with all applicable regulatory and advisory agency construction safety standards. Contractor's responsibility for review, monitoring, and coordination of the Subcontractors' safety programs shall not extend to direct control over execution of the Subcontractors' safety programs; notwithstanding Contractor's safety obligations to Owner, it is agreed and understood that each individual Subcontractor shall remain the controlling employer responsible for the safety programs and precautions applicable to its own work and the work activities of others in areas designated to be controlled by such Subcontractor.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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, lead paint, 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 report the condition to the Owner and Architect in writing.

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

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Contractor shall maintain a file of Safety Data Sheets (SDS) on site for all hazardous materials brought onto the job by the Contractor or any of its subcontractors. It is the Contractor's responsibility to use, store, dispose of, and provide personal protective equipment for any hazardous material used on site in accordance with the instructions in the SDS and other laws, regulations, codes, or polices. Any injury, property damage, illness, or enforcement action occurring as a result of the Contractor's failure to comply with the SDS requirements shall be the sole responsibility of the Contractor to remedy.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify 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. In the event of an emergency, the Contractor shall notify the Owner as soon as practical but not later than 24 hours form the time of the incident.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase

(Paragraphs deleted)

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 ethe Project is located. The Owner and Owner's employees, 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 insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 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.

§ 11.1.4 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.

§ 11.1.5 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cursed 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 LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered,

whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that

the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

(Paragraphs deleted)

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated,

installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an 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 written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5. During the 11th month after Substantial Completion, and before any warranties expire, the Contractor, together with the Architect and Owner, shall complete a final inspection of the Work.

§ 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, whether completed or partially completed, of the Owner or separate contractors 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 laws and regulations of the STATE OF ARKANSAS. Venue for any dispute resolution process shall be Pulaski County, Arkansas. Nothing in these General Conditions shall be construed to waive the sovereign immunity of the Owner, the State of Arkansas, or any entities thereof.

§ 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

(Paragraphs deleted)

§ 13.3.3 VERBAL AGREEMENTS

No Verbal Obligation, order, claim, or notice by any of the parties involved to the other parties shall be affect or modify any of the terms or obligations contained in the Contract Documents. None of the terms or provisions of the Contract Documents shall be considered waived or modified unless the waiver or modification thereof is in writing, and agreed upon by the parties in the form of a Change Order approved by the Owner, the Architect, and the Contractor. No evidence of any verbal objection, order, claim, or notice shall be introduced by any proceedings.

§ 13.5 TESTS AND INSPECTIONS

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

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

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

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

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

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

(Paragraphs deleted)

§ 13.6 FEDERAL FUNDING

Davis-Bacon Act of 1931

Where federal funds are used, insert Davis-Bacon Act language here.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors;

.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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

§ 14.4.2 Upon receipt of written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must 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 CONTINUING CONTRACT PERFORMANCE

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such 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 Upon written request from either party, the Initial Decision Maker will convene a meeting among the Owner's Project Representative, Construction Coordinator, Architect, and the Contractor. After reviewing the facts presented, the Initial Decision Maker will issue a written opinion to the Contractor regarding the Claim. If the Contractor is not in agreement with the opinion of the Initial Decision Maker, the **VICE CHANCELLOR FOR FACILITIES OR SIMILAR CAMPUS OFFICIAL** (the "Final Decision Maker") will convene a meeting with the Initial Decision Maker, the Owner's Project Representative, the Architect and the Contractor. The Contractor is encourage to have a representative of its senior management present at this meeting. After reviewing the facts, the Final Decision Maker, or his/her designee, will issue a written opinion to the Contractor, the Initial Decision Maker, and the Owner's Construction Coordinator regarding the Claim.

(Paragraphs deleted)

§ 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 15.1.6 shall be subject to mediation.

§ 15.3.2 If the parties do not a claim through the initial decision process described in the foregoing sections, then as a condition precedent to litigation or a claim in the Arkansas Claims Commission the parties shall in good faith participate in private, non-binding facilitative mediation seeking a just and equitable solution satisfactory to all parties. A request for mediation shall be made in writing and shall be directed to the other party within seven (7) business days following receipt of the opinion of the Final Decision Maker concerning the Claim. The parties shall in good faith obtain the services of a mediator with experience in mediating disputes, preferable with experience mediating construction related disputes. The parties will provide to the mediator and all other parties copies of the essential documentation relevant to the support or defense or the matter being mediated.

Mediation shall commence within ten (10) business days following the selection of the mediator unless such a period is extended by mutual agreement of the parties. The parties shall not be required to engage in mediation for a period greater than three (3) business days commencing with the first meeting with the mediator. The parties shall half equally in the administrative costs and fees of such proceedings but each shall be responsible for their expenses otherwise incurred. In no event shall commencement of mediation permit the Contractor to delay or withhold performance of the Work during the mediation proceedings. Any Claim of the Contractor subject to, but not resolved by mediation, shall be filed with the Arkansas Claims Commission.

§ 15.3.3 Owner does not, by entering in the Contract or by participating in mediation of any Claims, waive its sovereign immunity.

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(Paragraphs deleted)

Additions and Deletions Report for
AIA® Document A201® – 2007

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PAGE 1

UACCB Gateway FARM
Batesville, Arkansas

...

The Board of Trustees of the University of Arkansas acting for and on the behalf of the University of Arkansas Community College at Batesville

...

(Name, legal status and address)
Fennell Purifoy Architects, PLC
100 River Bluff Drive, Suite 320
Little Rock, AR 72202
PAGE 2

8.3.1, ~~11.3.10, 13.1,~~ 15.3.2, **15.4**
PAGE 5

3.17, **3.18**, 9.10.2, 10.3.3, ~~10.3.5, 10.3.6, 11.3.1.2, 11.3.7~~11.3

...

Insurance, ~~Loss of Use~~
~~11.3.3~~
~~Insurance,~~ Owner's Liability

...

10.2.5, **~~11.3~~11.3, 11.5**
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~~2.1.2,~~ **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3

...

2.2.1, 13.2.2, 14.1.1.4
~~Owner's Liability Insurance~~
~~11.2~~
PAGE 10

~~If the parties intend to transmit~~ The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital ~~form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.~~form. The parties will use AIA Document E203, Building information modeling and digital data exhibit, or other standards prescribed by the Owner to establish the protocols for the development, use, transmission, and exchange of digital data.

...

~~**§ 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.~~

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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 written 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 ~~deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor~~ default or neglect. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, ~~neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor~~ 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.

...

§ 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.~~ licensed by the State of Arkansas. The Contractor shall be lawfully licensed by the State of Arkansas. . 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.

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§ 3.4.4 The Contractor and Subcontractors shall comply with labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and with other laws, ordinances, and legal requirements applicable to the performance of the Work.

§ 3.4.5 The Work shall be performed in accordance with the Contract Documents by workers skilled and, when required, licensed in their respective trades.

...

§ 3.5.1 The Contractor shall guarantee and warrant its work and materials, and the work and materials of its subcontractors, for a period of one year from the date of Substantial Completion of the Work. The Warranty shall be for a longer period on certain items so designated in the specifications. The foregoing one-year guarantee and warranty shall not in any way limit, restrict, or affect the liability of Contractor or its subcontractors for indemnity as provided for in the Construction Documents, nor shall it in any way Shorten the period of limitation fixed by law for filing of any action against Contractor for enforcement or for the breach of any provisions of any Contract Document. Should Contractor elect to use any of the equipment in the building during construction period, Contractor shall make arrangements with the equipment supplier for any of the equipment in the building during

construction period, Contractor shall make arrangements with the equipment supplier for any available extension of warranty of that equipment made necessary by such use.

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

...

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. Under Arkansas law the Owner, a state agency, is exempt from permit fees or inspections requirements of county or municipal ordianances.
PAGE 14

§ 3.10.1 The ~~Contractor, promptly~~ Contractor within ten (10) days after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor ~~shall prepare a submittal schedule, promptly~~ within ten (10) days after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, 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.
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The Contractor shall provide the ~~Owner and Architect~~ Owner, Architect, and Owner's other consultants access to the Work in preparation and progress wherever located.
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§ 4.1.1 ~~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.~~

§ 4.1.1 The Architect is the person or entity retained by Owner pursuant to Section 2.3.2 and identified as such in the Agreement. The term Architect means Architect or Architect's authorized representatives and shall include by definition "Architect/Engineer," "Design Professional" and "Engineer" if these terms occur in the Contract Documents. .

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§ 5.2.5 Where an of the provisions of this Article 5 conflict with the requirements of Arkansas law, including without limitation section 22-9-204 of the Arkansas Code, Arkansas law shall govern.

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

the burden of proving the necessity and the cost of a Change Order requested by the Contractor. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

...

.2 Net Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

...

.5 ~~Additional costs of supervision and field office personnel directly attributable to the change.~~Net Placing cost.

For work performed by Contractor:

Net cost of materials	a
State sales tax	b
Net placing cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and profit %	
Multiplied by (a+b+c+d)	e
Allowable bond premium	f
CONTRACTOR ADJUSTMENT=a+b+c+d+f	

For work performed by Subcontractors:

Net cost of materials	a
State sales tax	b
Net placing cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and profit %	
Multiplied by (a+b+c+d)	e
Allowable bond premium	f
SUBCONTRACTORS ADJUSTEMENT= a+b+c+d+f	

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§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and ~~(5), if~~ (5) documentation of any special warranties, such as manufacturer's warranties or specific Subcontractor warranties and other close out documentation required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

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§ 10.2.9 CONTROLLING EMPLOYER

As between Owner and Contractor. Contractor is responsible to the Owner for any and all safety measures and issues relating to the Work on the Project. Contractor shall administer and manage the safety program for the Work. This will include but not necessarily be limited to, review of the safety programs of each of Contractor's, Subcontractors, Contractor shall monitor the establishment and execution of effective safety practices then known to the industry as applicable to the Work, and the compliance with all applicable regulatory and advisory agency construction safety standards. Contractor's responsibility for review, monitoring, and coordination of the Subcontractors' safety programs shall not extend to direct control over execution of the Subcontractors' safety programs; notwithstanding Contractor's safety obligations to Owner, it is agreed and understood that each individual Subcontractor shall remain the controlling employer responsible for the safety programs and precautions applicable to its own work and the work activities of others in areas designated to be controlled by such Subcontractor.

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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~~ asbestos, lead paint, 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 report the condition to the Owner and Architect in writing.
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§ 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 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.~~Contractor shall maintain a file of Safety Data Sheets (SDS) on site for all hazardous materials brought onto the job by the Contractor or any of its subcontractors. It is the Contractor's responsibility to use, store, dispose of, and provide personal protective equipment for any hazardous material used on site in accordance with the instructions in the SDS and other laws, regulations, codes, or polices. Any injury, property damage, illness, or enforcement action occurring as a result of the Contractor's failure to comply with the SDS requirements shall be the sole responsibility of the Contractor to remedy.
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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. In the event of an emergency, the Contractor shall notify the Owner as soon as practical but not later than 24 hours form the time of the incident.

...

§ 11.1.1 The Contractor shall purchase ~~from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:~~

- ~~**.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;~~
- ~~**.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;~~
- ~~**.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;~~
- ~~**.4** Claims for damages insured by usual personal injury liability coverage;~~
- ~~**.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;~~
- ~~**.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;~~
- ~~**.7** Claims for bodily injury or property damage arising out of completed operations; and~~
- ~~**.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.~~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 ethe Project is located. The Owner and Owner's employees, 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.

...

§ 11.1.3 ~~Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.~~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.

§ 11.1.4 ~~The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.~~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.

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

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~~§ 11.3.8~~ ~~A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.~~

~~§ 11.3.9~~ ~~If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.~~

~~§ 11.3.10~~ ~~The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of~~

~~binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.~~

~~§ 11.4 PERFORMANCE BOND AND PAYMENT BOND~~

~~§ 11.4.1~~ ~~The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.~~

~~§ 11.4.2~~ ~~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.~~

§

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

§ 11.5.2 Prior to settlement of an insured loss, by Contractor shall notify the Owner of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Owner shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Owner does not object, the Contractor shall deposit the insurance proceeds in a separate account and make appropriate distributions. Thereafter, if no other agreement is made of 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 Owner timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Contractor may 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.

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§ 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 an 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 written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section ~~2.4.~~2.5. During the 11th month after Substantial Completion, and before any warranties expire, the Contractor, together with the Architect and Owner, shall complete a final inspection of the Work.

...

The Contract shall be governed by the ~~law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~laws and regulations of the STATE OF ARKANSAS. Venue for any dispute resolution process shall be Pulaski County, Arkansas. Nothing in these General Conditions shall be construed to waive the sovereign immunity of the Owner, the State of Arkansas, or any entities thereof.

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~~**§ 13.4 RIGHTS AND REMEDIES**~~

~~**§ 13.4.1** 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.~~

~~**§ 13.4.2** No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.~~

§ 13.3.3 VERBAL AGREEMENTS

No Verbal Obligation, order, claim, or notice by any of the parties involved to the other parties shall be affect or modify any of the terms or obligations contained in the Contract Documents. None of the terms or provisions of the Contract Documents shall be considered waived or modified unless the waiver or modification thereof is in writing, and agreed upon by the parties in the form of a Change Order approved by the Owner, the Architect, and the Contractor. No evidence of any verbal objection, order, claim, or notice shall be introduced by any proceedings.

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the ~~Architect~~ Architect, Owner, and Commissioning Agent (if any) timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of ~~(1)~~ tests, inspections or approvals that do not become requirements until after bids are received or negotiations ~~concluded, and (2) tests, inspections~~ concluded. The Contractor shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations ~~prohibit the Owner from delegating their cost to the Contractor.~~so require.

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~~**§ 13.7 TIME LIMITS ON CLAIMS**~~

~~The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 13.7.~~

§ 13.6 FEDERAL FUNDING
Davis-Bacon Act of 1931

Where federal funds are used, insert Davis-Bacon Act language here.

...

.2 fails to make payment to Subcontractors ~~for materials or labor~~ or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors;

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§ 15.2.5 ~~The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~Upon written request from either party, the Initial Decision Maker will convene a meeting among the Owner's Project Representative, Construction Coordinator, Architect, and the Contractor. After reviewing the facts presented, the Initial Decision Maker will issue a written opinion to the Contractor regarding the Claim. If the Contractor is not in agreement with the opinion of the Initial Decision Maker, the **VICE CHANCELLOR FOR**

FACILITIES OR SIMILAR CAMPUS OFFICIAL (the "Final Decision Maker") will convene a meeting with the Initial Decision Maker, the Owner's Project Representative, the Architect and the Contractor. The Contractor is encourage to have a representative of its senior management present at this meeting. After reviewing the facts, the Final Decision Maker, or his/her designee, will issue a written opinion to the Contractor, the Initial Decision Maker, and the Owner's Construction Coordinator regarding the Claim.

~~**§ 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.~~

...

§ 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 15.1.6 shall be subject to ~~mediation as a condition precedent to binding dispute resolution.~~ mediation.

§ 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.~~ If the parties do not a claim through the initial decision process described in the foregoing sections, then as a condition precedent to litigation or a claim in the Arkansas Claims Commission the parties shall in good faith participate in private, non-binding facilitative mediation seeking a just and equitable solution satisfactory to all parties. 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.~~writing and shall be directed to the other party within seven (7) business days following receipt of the opinion of the Final Decision Maker concerning the Claim. The parties shall in good faith obtain the services of a mediator with experience in mediating disputes, preferable with experience mediating construction related disputes. The parties will provide to the mediator and all other parties copies of the essential documentation relevant to the support or defense or the matter being mediated.

Mediation shall commence within ten (10) business days following the selection of the mediator unless such a period is extended by mutual agreement of the parties. The parties shall not be required to engage in mediation for a period greater than three (3) business days commencing with the first meeting with the mediator. The parties shall half equally in the administrative costs and fees of such proceedings but each shall be responsible for their expenses otherwise incurred. In no event shall commencement of mediation permit the Contractor to delay or withhold performance of the Work during the mediation proceedings. Any Claim of the Contractor subject to, but not resolved by mediation, shall be filed with the Arkansas Claims Commission.

§ 15.3.3 ~~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.~~Owner does not, by entering in the Contract or by participating in mediation of any Claims, waive its sovereign immunity.

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~~**§ 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. 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~~ ~~Either party, at its sole discretion, 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~~ ~~Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.~~

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Phil Purifoy, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:53:09 ET on 04/17/2025 under Order No. 4104244172 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SUPPLEMENTARY CONDITIONS
Section 008000

MODIFICATIONS TO GENERAL CONDITIONS- Section 007000

ARTICLE 11 - INSURANCE AND BONDS

1. Subparagraph 11.1.1, add the following sentence:

The amount of such insurance shall be not less than the following or any limits required by law.

2. Subparagraph 11.1.2, add the following clause:

11.1.2.2 Worker's Compensation:
A. State: Statutory
B. Applicable Federal Statutory
C. Employer's Liability $ 100,000.00 per Accident
$ 500,000.00 Disease, Policy Limit
$ 100,000.00 Disease, each Employee

3. Subparagraph 11.1.3, add the following clause:

11.1.3.2 Comprehensive General Liability

General Aggregate: $ 1,000,000.00

Completed Operations to be maintained for one year after final payment: $ 1,000,000.00 Aggregate

Personal Injury $ 1,000,000.00 Each Occurrence

Each Occurrence Limit $ 1,000,000.00 Each Occurrence

Automobile Liability (including owned, non-owned, and hired vehicles) $ 1,000,000.00 Combined Single Limit

Umbrella Excess Liability $ 1,000,000.00

4. Subparagraph 11.1.4, add the following clause:

Owner’s and Contractor’s Protection Liability $ 1,000,000.00 Combined Single Limit

END OF DOCUMENT

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information: UACCB Gateway Center FARM with architectural finishes and the appropriate mechanical, electrical, and plumbing systems/renovations.

1.3 PROJECT INFORMATION

A. Project Identification: UACCB Gateway Center FARM.

1. Project Location: Batesville, Arkansas
2. Owner:

a. UACCB
2005 White Drive
Batesville, AR 72501

b. Architect: Fennell Purifoy Architects
100 River Bluff Drive, Suite 320
Little Rock, AR 72202

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 011010 - WORK RESTRICTIONS

PART 1 GENERAL

1.1 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to site and block areas indicated on drawings

1.2 OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion and Permission to Occupy for each specific portion of the Work to be occupied before Owner occupancy.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.

3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building or buildings.

PART 2 PRODUCTS-(Not Used)

PART 3 EXECUTION-(Not Used)

END OF SECTION

SECTION 01200 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

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

C. Change procedures.

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

1.02 RELATED REQUIREMENTS

C. Section 01200 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

A. Form to be used: AIA Form G703 - Applications and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

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

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

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

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

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

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

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

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

B. Execute certification by signature of authorized officer.

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

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

E. Submit three copies of each Application for Payment.

F. When UACCB requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Metropolitan Housing Alliance will issue instructions directly to Contractor.

B. Construction Change Directive: Contractor must coordinate all changes in work with owner. Contractor may issue a document, signed by Owner, before proceeding with a change in the Work, for subsequent inclusion in a Change Order.
   1. The Document will describe changes in the work and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change in Work.

C. Proposal Request: Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. General contractor shall prepare and submit a fixed price quotation within 7 days.

D. General Contractor may propose a change by submitting a request for change to UACCB, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01600.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

F. Substantiation of Costs: Provide full information required for evaluation.

G. Execution of Change Orders: General Contractor will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

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

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

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit 1(one) digital copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

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

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

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

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

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

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

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive . Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
2. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
3. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.

1.3 APPLICATIONS FOR PAYMENT

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

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

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or proceeded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. Copies of building permits.
6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
7. Initial progress report.
8. Report of preconstruction conference.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. AIA Document G707.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

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

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

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

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

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

1.6 COORDINATION DRAWINGS

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

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

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

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Contractor must sign digital drawing use waiver form provided by the architect before obtaining digital drawings.
3. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.

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

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Time schedules.
i. Weather limitations.
j. Manufacturer's written instructions.
k. Warranty requirements.
l. Compatibility of materials.
m. Acceptability of substrates.
n. Temporary facilities and controls.
o. Space and access limitations.
p. Regulations of authorities having jurisdiction.
q. Testing and inspecting requirements.
r. Installation procedures.
s. Required performance results.
t. Protection of adjacent work.
u. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site use.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of Proposal Requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.

1.5 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work and the Notice to Proceed.

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

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

1.2 DEFINITIONS

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

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

1.3 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

B. General: The Contractor to submit submittals in electronic form for use in architectural and consultant review.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

1.4 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's product specifications.
    b. Standard color charts.
    c. Statement of compliance with specified referenced standards.
    d. Testing by recognized testing agency.
    e. Application of testing agency labels and seals.
    f. Notation of coordination requirements.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

D. All submittals and shop drawings must have a contractors review stamp. Any submittal without this stamp will be returned with no action taken by the architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES (if needed –or coordinate location in existing building with owner)

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground unless otherwise indicated.

G. SUPPORT FACILITIES INSTALLATION

H. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

I. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

J. Parking: Provide temporary parking areas for construction personnel.

1. Parking for construction personnel or storing of construction materials is not allowed under the area within the drip line of existing trees onsite.

K. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

L. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

M. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Provide walk-off mats at each entrance through temporary partition.

E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 311000 "Site Clearing" for limits on clearing; disposition of vegetative clearing debris.
2. Section 31 2000 - Earthwork: Temporary and permanent grade changes for erosion control.
3. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.2 DEFINITIONS

A. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated, defined by a circle concentric with each tree with a radius 12 times the tree's caliper size and with a minimum radius of 96 inches unless otherwise indicated. Reference Demo and Tree Preservation Plan for tree protection fence locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment-movement routes and material storage locations with protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

D. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: From ISA certified arborist, certifying that trees indicated to remain have been protected during construction in accordance with recognized standards and that trees were promptly and properly treated and repaired when damaged.

B. Maintenance Recommendations: From ISA certified arborist, for care and protection of trees affected by construction during and after completing the Work.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA,Licensed arborist in jurisdiction where Project is located, Current member of ASCA, Registered Consulting Arborist as designated by ASCA.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of 2 parts stockpiled soil to 1 part planting soil.
2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation"

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch OD line posts, and 2-7/8-inch OD corner and pull posts; with 1-5/8-inch OD top rails, ; with 0.177-inch diameter top tension wire and 0.177-inch diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

a. Height: 48 inches.

2. Wood Protection-Zone Fencing: Constructed of two 2-by-4 inch horizontal rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 96 inches apart, and lower rail set halfway between top rail and ground.

a. Height: 48 inches.

3. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi;secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches.

4. Gates: Single- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width As indicated.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering, stating “Notice: Tree Preservation Area DO NOT ENTER” or other verbiage as required by

Urban Forester for the jurisdiction in which work will take place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Tree-Protection Area: An Arborist shall examine all trees to remain and assess the health and maintenance needed for each individual tree. A report shall be generated from the Arborist and submitted to the Contractor, Owner and Landscape Architect.

3.2 PREPARATION

A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots by hand or using an air spade of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise

indicated. Do not prune for shape unless otherwise indicated.

2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees in accordance with ANSI A300 (Part 1) and as indicated on Drawings.

B. Cut branches with sharp pruning instruments; do not break or chop.

C. Chip removed branches and spread over areas identified by Architect.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

B. Reports: All trees disturbed or damaged within a tree protection area or easement are to be assessed and a report produced by an arborist. All trees to remain are to be evaluated individually in a report by an arborist. Report is to be reviewed and approved by the Landscape Architect. All associated cost of arborist and associated work recommended in reports are to be at the contractor’s expense. Including but not limited to pruning, dead wooding, tree removal and legal disposal of material offsite.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to

remain.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2000 – Earthwork: Temporary and permanent grade changes for erosion control

C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.3 PERFORMANCE REQUIRMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency (EPA)and Arkansas Department of Environmental Quality (ADEQ) for erosion and sedimentation control.

1. Comply with requirements and recommendations of the EPA National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP)
2. Comply with requirements and recommendations of the ADEQ Construction Stormwater Discharge Permit ARR150000.
3. Comply with requirements and recommendation of the ADEQ Short Term Activity Authorization Permit, Specification Section 001001.

B. Comply with requirements of State of Arkansas, Erosion and Sedimentation Control Manual.

C. Comply with requirements of the City of Batesville.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit weekly

inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Obtain and pay for permits and provide security required by authority having jurisdiction.

F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place prior to disturbance of surface cover and before precipitation occurs.

H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the

project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

M. Open Water: Prevent standing water that could become stagnant.

N. Maintenance: Maintain temporary preventative measures until permanent measures have been established.

O. All area left disturbed longer than 14 days shall be vegetated and/or stabilized.

1.4 SUBMITTALS

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

B. Erosion and Sedimentation Control Plan:

1. Submit within 2 weeks after Notice to Proceed.
2. Include:

    a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
    b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
    c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
    d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
    e. Other information required by law.
    f. Format required by law is acceptable, provided any additional information specified is also included.

3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay, certified weed seed free ‘clean’.
2. Erosion control matting or netting, bio- or photo-degradable straw, coconut, coir or jute.
3. 100% Wood Fiber Hydroseeding Mulch

B. Grass Seed for Temporary Cover: If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

1. Summer Temporary Cover: May -September shall be Browntop Millet seeded at 100 lbs per acre and Plains Coreopsis seeded at 2 lbs per acre.
2. Winter Temporary Cover: September-May – shall be Cereal Rye -Secale cereale grain – 200 lbs/acre.

C. Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2 by 2 inches in cross section.

D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

E. Silt Fence Posts: One of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

F. Gravel: See Section 32 1123 for aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
b. Along the toe of cut slopes and fill slopes.
c. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
d. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

a. Slope of Less Than 2 Percent: 100 feet..
b. Slope Between 2 and 5 Percent: 75 feet
c. Slope Between 5 and 10 Percent: 50 feet.
d. Slope Between 10 and 20 Percent: 25 feet.
e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use on piece of fabric wrapped at least 1-1/2 times around concrete blocks

and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3-1:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.

3.5 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Ecological Design Group, Inc.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

3.6 MAINTENANCE

A. Contractor shall maintain, repair, replace or add best management practices and structural erosion and sediment controls as necessary or required to maintain project compliance with all applicable local, state and federal requirements, including Project specific Permits.

3.7 WARRANTY

A. Contractor shall warrant the project for Permit compliance for the duration of all project work or project area surface disturbance and for one year after project completion, whichever is longer.

B. Contractor shall pay for any and all fines, fees or costs incurred by the Project or Owner for non-compliance with Permit requirements.

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor and professional engineer certifying that location and elevation of improvements comply with requirements.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Remove and replace damaged, defective, or non-conforming Work.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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

C. Temporary Support: Provide temporary support of work to be cut.

D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

E. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."

2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas firstand proceeding from lowest floor to highest floor.

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations, before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017800 - 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 00700 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01700 - Execution 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 Fennell Purifoy Architects 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. Fennell Purifoy Architects 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 the owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Fennell Purifoy Architects comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in **electronic format** in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with the 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.
7. The above set is for project coordination only.

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

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

D. Record information concurrent with construction progress.

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

F. Submit 2 cd's both containing closeout documents, owner & maintenance manuals, copies of all approved submittals and as-built drawings to architect **(This is a requirement that must be followed large paper copy 3 ring binders will not be accepted).**

3.02 OPERATION AND MAINTENANCE DATA

A. 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.

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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. 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.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

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

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

H. Include sequence of operation by controls manufacturer.

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

J. Provide control diagrams by controls manufacturer as installed.

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

3.05 OPERATION AND MAINTENANCE MANUALS

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

B. Prepare data in the form of an instructional manual & place electronically on a cd.

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

D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

E. Text: Manufacturer's printed data, or typewritten data.

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

G. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Fennell Purifoy Architects, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.

b. List of equipment.
c. Parts list for each component.
d. Operating instructions.
e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Fennell Purifoy Architects, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

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 the owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

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

C. Co-execute submittals when required.

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

E. Manual: Prepare data in the form of the warranties and bonds electronically on a cd.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.4 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.2 MATERIALS OWNERSHIP

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

1.3 FIELD CONDITIONS

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

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

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

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

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

3.2 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Remove temporary barricades and protections where hazards no longer exist.

3.3 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least two hours after flame-cutting operations.
5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
6. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.4 CLEANING

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

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

END OF SECTION

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SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

1.2 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Form ties.
2. Waterstops.
3. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
3. Indicate location of waterstops (if needed).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

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

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

    a. Plywood, metal, or other approved panel materials.
    b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

        1) APA HDO (high-density overlay).
        2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
        3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
        4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

2.3 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes and Section 033300 "Architectural Concrete".

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips.
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. 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.
6. Space vertical joints in walls as indicated on Drawings.

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 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 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.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

3.4 FIELD QUALITY CONTROL

A. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement to Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

PART 2 - PRODUCTS

2.1 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

B. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; compression-only type.

C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.2 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.

1.2 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Aggregates.
3. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

4. Vapor retarders.
5. Curing materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.

3. Durability exposure class.
4. Calculated equilibrium unit weight, for lightweight concrete.
5. Slump limit.
6. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
7. Intended placement method.
8. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

    a. Shop Drawings:

9. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

    a. Location of construction joints is subject to approval of the Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Aggregates.
3. Admixtures:

1.5 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."

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 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, and as follows:

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I , gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. 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 inch nominal.

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 in steel-reinforced concrete.

E. Water and Water Used to Make Ice: ASTM C94/C94M, potable or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Barrier One, Inc.
    b. Stego Industries, LLC.
    c. W.R. Meadows, Inc.

2.4 CURING MATERIALS

A. Water: Potable or complying with ASTM C1602/C1602M.

B. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Dayton Superior.
    b. Euclid Chemical Company (The); an RPM company.
    c. W.R. Meadows, Inc.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

2.6 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.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.3 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.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. 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.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

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.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.5 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.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

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.

3.6 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten 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 unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch and also no more than 1/16 inch in2 feet.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aluminum granule finish to concrete stair treads, platforms, ramps as indicated on Drawings

1. Apply in accordance with manufacturer's written instructions and as follows:

    a. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aluminum granules over surface in one or two applications.
    b. Tamp aggregate flush with surface, but do not force below surface.
    c. After broadcasting and tamping, apply float finish.

d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.7 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. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
5. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.8 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. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    c. 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) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.
            b) Continuous water-fog spray.

    b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

        1) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.
            b) Continuous water-fog spray.

    c. Floors to Receive Curing Compound:

        1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.

d. Floors to Receive Curing and Sealing Compound:

1) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

A. Conform to ACI 117.

3.10 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated building columns.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Connection designs have been completed and connections indicated on the Drawings. Contractor to submit shop drawings showing all member sizes, connections, and configurations for review and approval by design team.

2. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: Type FR, fully restrained unless indicated otherwise on the structural drawings.

D. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

B. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates Bearing Plates and: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

END OF SECTION

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that power-actuated mechanical fasteners comply with requirements.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:

a. AWS D1.3/D1.3M.

B. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its "RoofNav" for Class 1 fire rating and Class 1-90 windstorm ratings. Identify materials with FM Approvals Certification markings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. Cordeck.
4. Nucor Corporation, Verco Group.
5. Vulcraft; Nucor Corporation, Verco Group.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

2. Profile Depth: 1-1/2 inches .
3. Design Uncoated-Steel Thickness: As indicated .
4. Side Laps: Overlapped.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Galvanizing Repair Paint: ASTM A780/A780M.

F. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.

3.2 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds in a 36/4 pattern as indicated on the structural drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, #10 Tek screws between supports.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space [welds] [mechanical fasteners] not more than 12 inches apart with at least one [weld] [fastener] at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.3 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfacesof prime-painted deck immediately after installation, and apply repair paint.
2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

    a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Product test reports.

D. Research Reports:

1. For and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ClarkDietrich.
2. MarinoWARE.
3. MRI Steel Framing, LLC.
4. United Metal Products, Inc.
5. United Steel Deck, Inc.
6. Substitutions: See Section 016000 - Product Requirements

2.2 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S200 and ASTM C955, Section 8.

1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G90 or equivalent.

B. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required for structural performance.
2. Flange Width: As required for structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching base-metal thickness of steel studs.

C. Vertical Deflection Clips, Interior: Manufacturer's standard bypass head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. AllSteel & Gypsum Products, Inc.
b. ClarkDietrich.
c. MarinoWARE.
d. Simpson Strong-Tie Co., Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel [hex-headed bolts,] [headless, hooked bolts,] [headless bolts, with encased end threaded,] carbon-steel nuts, and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B695, Class 50.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

D. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.

1. Fasten both flanges of studs to top and bottom tracks.
2. Space studs as follows:

    a. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

F. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

G. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

H. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 INSTALLATION OF INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to studs and anchor to building structure.
3. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

3.5 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 REPAIRS

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Shop primers.
2. Paint Products.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A53M, Standard Weight unless otherwise indicated.

E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
2. Material: Galvanized steel, ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.

3. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

C. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

C. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with 1/4-inch- thick steel.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF METAL LADDERS

A. Secure ladders to adjacent construction with the clip angles attached to the stringer.

B. Install brackets as required for securing of ladders welded or bolted to structural steel or built into masonry or concrete.

3.3 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.4 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

3.5 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

SECTION 055150 – ALUMINUM LADDER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum cage ladders.

1.2 RELATED SECTIONS

A. Section 05500 – Metal Fabrications: Fasteners and installation requirements used to attach ladders to structure.

B. Section 14200 – Elevators: For pit ladders.

C. Section 15050 – Basic Electrical Materials and Methods: For electrical grounding of ladders.

1.3 REFERENCES

A. AA – Aluminum Association.

B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. OSHA 1910.27 – Fixed Ladders.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product.

C. Shop Drawings:

1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.

2. Provide templates for anchors and bolts specified for installation under other Sections.

3. Provide reaction loads for each hanger and bracket.

D. Qualification Data:

1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.

E. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.

F. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150 mm) square, represent actual product color.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.

1. Record of successful in-service performance.

2. Sufficient production capacity to produce required units.

3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.

B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.

C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Install ladder in area designated by Architect.

2. Do not proceed with remaining work until workmanship and installation are approved by Architect.

3. Rework mock-up as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurement before fabrication.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.8 WARRANTY

A. A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.

1. Defects in materials and workmanship.

2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.

3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.

B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.9 EXTRA MATERIALS

A. Furnish touchup kit for each type and color of paint finish provided.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: O'Keeffe's, Inc.; 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: http://www.okeeffes.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 APPLICATIONS/SCOPE

A. Fixed and Cage Ladder Design:

1. Safety cages are required on ladders over 20 feet (6096 mm)

2. Safety cages are required on all ladders in high or hazardous areas.
3. Landing platforms are required at 30 feet (9144 mm) above the bottom of the ladder.
4. Rail and harness fall arrest system as alternate to safety cage and landing platforms shall be a permissible manufacturer's option.
    a. Fixed Ladder Bottom Bracket:
    b. Bottom floor supported bracket.
    c. Bottom wall supported bracket.
    d. Bracket as drawn.

B. Cage Ladder:
1. Cage Ladder with Roof Hatch Rail Extension.
    a. Model 531 as manufactured by O'Keeffe's Inc.

2.3 FINISHES

A. Mill finish. As extruded.

B. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.

C. Paint. Urethane over chemically pretreated substrate.
1. Fire Red (RAL 2002).
2. Alert Orange (RAL 2003).
3. Warning Blue (RAL 5005).
4. Caution Yellow (RAL 1018).
5. Safety Green (RAL 6001).
6. As scheduled on drawings.

2.4 MATERIALS

A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.

B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.5 FABRICATION

A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18–3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.

    1. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.

B. Channel Side Rails: Not less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide.

C. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.

D. Ship Ladders: Not less than 1-1/4 inches (32mm) high, 4-1/8 inch (105 mm) deep and 2 feet (610 mm) wide; tread spacing shall be 1 foot (305 mm) on center. Handrails shall be aluminum pipe, not less than 1-1/2 inches (38 mm) in diameter with hemispheric end caps.

E. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.

F. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.

G. Security Doors: Formed 1/8 inch (3 mm) thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2 inches (51 mm) of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy duty forged steel locking hasps.

H. Ship Ladder Seismic Bottom Support: Manufacturer’s standard; two isolation bearings per stringer.

I. Ladder Safety Post: Retractable hand hold and tie off.

J. Rail and Harness Fall Arrest System: Supplied where specified as alternate to safety cage and landing platforms, in accordance with OSHA regulation 1910.27; permanently mounted to ladder rungs and complete with necessary components.

K. Safety Cages:

    1. Fabricate ladder safety cages to comply with authority having jurisdiction. Assemble by welding. Spacing of primary hoops, secondary hoops and vertical bars shall not exceed that required by code.

    2. Safety cage hoops and vertical bars: 3/16 inch (5 mm) by 2 inches (51 mm) aluminum bar.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.

B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.

C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking, cants, and nailers.
2. Wood furring.
3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Power-driven fasteners.
2. Post-installed anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent unless otherwise indicated.

2.2 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.

2.3 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, [fire-retardant treated,] in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.4 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.5 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. Cleveland Steel Specialty Co.
2. MiTek Industries, Inc.
3. Simpson Strong-Tie Co., Inc.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate [**furring,**]nailers, blocking, [**grounds,**]and similar supports to comply with requirements for attaching other construction.

C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Do not splice structural members between supports unless otherwise indicated.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).

2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested in accordance with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.\
2. Thickness: 1/2 inch

2.3 WALL SHEATHING

A. Plywood Sheathing, Walls: DOC PS 1, Exposure 1, Structural I sheathing.

B. Paper-Surfaced Gypsum Sheathing: ASTM C1396/C1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Huber Engineered Woods LLC; Zip System R Sheathing .
    b. Requests for substitutions will be considered in accorance with provisions of Section 016000 - Product Requirements.

2. Thickness: 1 1/2" (refer to drawings for locations).
3. Thermal Resistivity (R-Value): 6.6 deg F x h x sq. ft./BTU x in. at 75 deg F.
4. Edge Profile: Square edge
5. Exterior Facer: Medium-density, phenolic-impregnate polymer-modified sheet material meeting requirements for ASTM D779 Grade D weather-resistive barrier in accordance with ICC AC38 and AC310, with fastener spacing symbols on exterior facer for 16-inch (406 mm) and 24-inch (610 mm) on center spacing, with the following characteristics.

    a. Water Resistance of Coatings, ASTM D2247: Pass 14 day exposure test.
    b. Moisture Vapor Transmission, ASTM E96: Not less than 12 perms.
    c. Water Penetration, ASTM E331: Pass at 2.86 lbf/sq. ft. (137 Pa).
    d. Wind Driven Rain, TAS-100: Pass
    e. Accelerated Weathering, ASTM G154: Pass

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M of Type 304 stainless steel.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

B. Sheathing Joint for insulated sheathing:

1. Self-Adhearing Seam and Flashing Tape: Pressure-sensitive, self-adhearing, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting ICC ACI 48.

a. Basis-of-Design Product: Provide Huber Engineered Woods; ZIP system tape.
b. Thickness: 0.012 inch (0.3mm).

2. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

C.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesive shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:

a. Screw to cold-formed metal framing.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION

SECTION 062200 - FLEXIBLE WOOD TAMBOUR PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide flexible wood tambour panels of the following types:

1. Solid wood tambours.
2. Veneer tambours.

B. Related Sections: Coordinate with the following as applicable:

1. Section 064000 - Architectural Woodwork for other woodwork.
2. Section 092116 - Gypsum Board Assemblies for substrate.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature including product characteristics and accessories.

B. Shop Drawings: Submit diagram showing layout of pattern and configuration, including details of perimeter conditions and mounting.

C. Verification Samples: Submit samples of materials selected for use to verify profile, color, and finish.

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5 years experience manufacturing similar products.

B. Installer: Minimum of 2 years experience installing similar products.

C. Field Measurements: To the greatest extent practical, take field measurements prior to fabrication.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Surfacing Solution, 2480 Chaska Blvd., Chaska, MN 55318. Tel 800-964-6727. Direct 952-448-6556. www.SurfacingSolution.com.

2.2 WOOD VENEER TAMBOUR PANELS

A. Basis of Design: Real Wood Veneer Tambour by Surfacing Solution.

1. Panel Size: 4 x 8 feet (1219 x 2438 mm).
2. Core Material: MDF or black PVC.
3. Profile 431:

a. Slat Width: 1 inch (25 mm).
b. Slat Height: 5/32 inch (4.0 mm).
c. Texture: Smooth.
d. Species: Maple.

4. Field Finish: Clear.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions, approved submittals and in proper relationship to adjacent construction.

1. Clean substrate of dirt and bond breaking substances prior to beginning installation.
2. Acclimatize panels at the installation site for a minimum of 48 hours prior to installation.
3. Roll tambour panels in accordance with manufacturer's instructions to properly space slats.
4. Follow manufacturer's recommendations for adhesives and mounting devices.
5. Replace damaged or defaced products prior to Substantial Completion.

3.3 CLEANING

A. Clean surfaces to remove soiling, stains, dust, and dirt using materials acceptable to manufacturer.

B. Leave installation area clean and free of residue and debris resulting from work of this Section.

END OF SECTION

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.6 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

B. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Basis of Design: Formica Corporation.
b. Wilsonart LLC.
c. Subsitutions: See Section 016000 - Product Requirements.

C. Grade: Premium.

D. Exposed Surfaces:

1. Plastic-Laminate Grade:

a. Horizontal Surfaces: Grade HGL.
b. Vertical Surfaces: Grade HGS.

E. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.

F. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Basis of Design: 0912 Ebony – Texture by Formica

2. Or as selected by Architect from laminate manufacturer's full range in the following categories:

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Composite Wood Products: Formaldehyde emission rates shall not be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:

a. 7-ply veneer core plywood or MDF boards with type II water resistant glue for laminates.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."

B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: ANSI/BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: ANSI/BHMA A156.9, B01521.

C. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 100 degrees of opening[, self-closing].

D. Wire Pulls: Back mounted, solid [metal] [plastic], 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.

F. Drawer Slides: ANSI/BHMA A156.9.

1. Standard Duty (Grade 1 and Grade 2): Side mount and extending under bottom edge of drawer.

G. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

B. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

C. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Glass-fiber blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than 25 and 450 when tested in accordance with ASTM E84.

2.2 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics. Refer to drawings for thickness and locations either at perimeter walls or sound batt interior walls.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Certainteed; SAINT-GOBAIN.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.
e. Subsitutions: See Section 01 60 00 - Product Requirements.

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

END OF SECTION

SECTION 07 21 13 - FOAM BOARD INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide FOAMULAR THERMAPINK XPS extruded polystyrene rigid board insulation.

1.2 REFERENCES

A. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

1. American Society for Testing of Materials (ASTM):
    a. ASTM C 578: Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
    b. ASTM C 518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
    c. ASTM E 108: Class A, E119 Standard Test Method for Surface Burning Characteristics of Building Materials.
2. International Code Council Evaluation Service (ICC-ES), Evaluation Report.

1.3 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance criteria, and limitations, including installation instructions.

B. Sustainable Design: Submit manufacturer’s sustainable design certifications as indicated.

C. Warranty: Submit documentation for limited product warranty. 5 years

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain exterior building insulation through one source from a single manufacturer.

B. Each insulation board must be labeled with manufacturer's name, product brand name, ASTM material specification reference, and identification of the third party inspection agency used for building code qualification.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original packaging.

B. Store and protect products in accordance with manufacturer’s instructions. Store in a dry area and protect from water, direct sunlight, flame, and ignition sources. Do not install insulation that has been damaged or wet.
1. In the event the board insulation becomes wet, wipe dry prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of design: Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com.
   1. Product: FOAMULAR THERMAPINK XPS by Corning.

B. Substitutions: 001600 Product Requirements for substitution requirement.

2.2 FOAM PLASTIC BOARD INSULATION (with nailable top face)

A. Extruded Polystyrene Board Insulation: Comply with ASTM C 578, Type IV, 25 psi minimum compressive strength, 1.55 lb/cu. ft. (26 kg/cu. m)
   1. Thermal Resistance: (180 day real-time aging as mandated by ASTM C578, measured per ASTM C 518 at mean temperature of 75F): R-5.0, 5 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.
   2. Blowing Agent Formulation: Zero ozone depleting.
   3. Edge Condition: Square
   4. Surface Burning Characteristics (ASTM E 84): Flame spread less than 25, smoke developed less than 450, certified by independent third party such as Underwriters Laboratories (UL).
   5. Indoor Air Quality: Compliance certified by independent third party such as GREENGUARD Indoor Air Quality Certified® and/or GREENGUARD Children and Schools Certified℠.
   6. Recycled Content: Minimum 20%, certified by independent third party such as Scientific Certification Systems.
   7. Warranty: Limited lifetime warranty covering all ASTM C578 physical properties.
   8. Panel Size: Provide 1” thick by 4 ft. wide by 8 ft. long (4” total w/nailable top face)
      a. R-Value total = 20

PART 3 - EXECUTION [Not Used]

END OF SECTION

SECTION 07 21 29 - SPRAYED CELLULOSE THERMAL INSULATION

PART 1 - –GENERAL

1.1 Section Includes

A. Sprayed cellulose thermal insulation.

B. Sprayed cellulose acoustical insulation.

1. Related Items

C. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.

D. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.

E. Roof penetrations to be installed prior to application.

1. Quality Assurance

F. Manufacturer must have a current Underwriters Laboratories (UL) Code Evaluation Report.

G. Manufacturer must be in compliance with the 2009 and 2012 International Building Code.

H. Manufacturer must be ISO 9001:2008 Certified.

I. Applicator: Licensed by manufacturer.

J. Manufacturer must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.

K. Mock-up: Apply a 100 square foot representative sample to be reviewed by the Architect and/or Owner prior to proceeding.

1. Submittals

L. Submit product data that the product meets or exceeds the following specified requirements.

1. Bond strength shall be greater than 100 psf per ASTM E 736.
2. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
3. Non-corrosive per ASTM C 739.

4. Bond Deflection per ASTM E 759: 6" Deflection in 10' Span – No Spalling or Delamination.
5. R-Value to be 3.75 per inch per ASTM C518. Total R-Value to be R-48 in attic of apartment units.
6. Comply with IBC 803.3/2009 IBC 803.10 stability requirements for interior finishes.
7. Meet ASTM C 1149

M. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

N. Copy of manufacturer's ISO 9001:2008 Certification.

O. Minimum Fiber Recycled Content to be 75%.

P. Cannot contain any added Urea-Formaldehyde Resins.

1. Delivery, Storage and Handling

Q. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.

R. Store materials dry, off ground, and under cover.

S. Protect liquid adhesive from freezing.

T. Water to be potable.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturer

A. International Cellulose Corporation
12315 Robin Boulevard
Houston, Texas 77045
(713) 433-6701 or (800) 444-1252
FAX: (713) 433-2029
www.spray-on.com icc@spray-on.com
For approved applicators contact ICC at 800-444-1252.

B. Applegate Insulation: www.applegateinsulation.com

C. Nu-Wool Co., Inc.: www.nuwool.com

D. Substitutions: See Section 01600 - Product Requirements.

2.02 Materials

A. K-13 Spray-On-Systems.
Color shall be from Manufacturer's standard color chart.
Comply with local Building Code requirements.
Material to have been tested in accordance with ASTM E 1042. Testing laboratory must be NVLAP accredited.

2.03 Accessories

A. Rafter Vent with Built-In Baffle. Install between rafters to provide an unobstructed air channel through insulation to help keep air flowing freely from soffits to ridge vents. The ADO Products: Durovent 23-1/2 in. x 46 in. or approved equal.

PART 3 - EXECUTION

3.01 Examination

A. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.
Verify surfaces to receive spray insulation to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains.

3.1 Preparation

A. Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.

B. Coordinate installation of the sprayed cellulose fiber with work of other trades.

C. Prime surfaces as required by manufacturer's instructions or as determined by examination.

3.2 Installation

A. Install spray applied insulation according to manufacturer's recommendations.

B. Install spray applied insulation to achieve an average NRC of 1.05 and min. R-Value of 1.5" thickness.

K-13 Sprayed Thermal and Acoustical Insulation ASTM C-423 on Solid Backing*							
Inches	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
1.00	0.08	0.29	0.75	0.98	0.93	0.96	0.75
1.00**	0.47	0.90	1.10	1.03	1.05	1.03	1.00
2.00	0.26	0.68	1.05	1.10	1.03	0.98	0.95
3.00	0.57	0.99	1.04	1.03	1.00	1.00	1.00
K-13 Sprayed Thermal and Acoustical Insulation Applied at 1.5" Ribbed Metal Deck*							
Inches	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
1.50	0.36	0.89	1.26	1.07	1.01	1.00	1.05
3.00	0.97	1.04	1.13	0.99	0.95	0.98	1.05

*Some values interpolated **On lath

C. Cure insulation with continuous natural or mechanical ventilation.

D. Remove and dispose of over-spray.

3.3 Protection

A. Protect finished installation under provision of Division 1.

END OF SECTION

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam metal wall panels.
2. Concealed-fastener, lap-seam metal wall panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Samples of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Basis of Design PAC-CLAD Petersen, Precision Series Box Rib metal wall panel with all associated mid-season trim, outside corner trim, inside corner trim, J trim terminations, closure pieces, and all other associated trim and accessories needed for a complete installation.

Basis of Design Western States Metal Roofing, T-8 Plankwall Metal Soffit and Wall Panels with all associated mid-season trim, outside corner trim, inside corner trim, J trim terminations, closure pieces, and all other associated trim and accessories needed for a complete installation.

A. Type 1 (Refer to drawings): PAC-CLAD Petersen, Precision Series Box Rib metal wall panel-mixture of 1/5 of Box Rib 1; 2/5 of Box Rib 2; 2/5 of Box Rib 3.

1. Finish (color): Almond

B. Type 2 (Refer to drawings): Western States Metal Roofing – T-8 Plankwall & Soffit –.

1. Finish (color): Rosewood

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft..

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION

A. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

B. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

1.2 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

B. Sample Warranty: For special warranty.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested[and FM Approvals approved], shop is to be listed as able to fabricate required details as tested and approved.

1.4 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual"requirements for dimensions and profiles shown unless more stringent requirements are indicated.

B. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat embossed surface.

B. Stainless Steel Sheet: ASTM A240/A240M, [Type 304] [Type 316], dead soft, fully annealed; with smooth, flat embossed surface.

2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[or manufactured item].

1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder welds sealant.
2. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
4. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
5. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
6. Do not field cut sheet metal flashing and trim by torch.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.2 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements[**, sheet metal manufacturer's written installation instructions,**] and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

3.3 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.4 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

END OF SECTION

SECTION 07 63 10 - GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.2 RELATED REQUIREMENTS

A. Section 042001 – Masonry Veneer

B. Section 076113 - Standing Seam Sheet Metal Roofing:

C. Section 076200- Sheet Metal Flashing and Trim

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate ; 2010.

1.4 DESIGN REQUIREMENTS

A. Conform to SMACNA Architectural Sheet Metal Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Product Data: Provide data on prefabricated components.

D. Samples: Submit two samples, 12 inches long, illustrating component design, finish, color, and configuration.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

1.7 PROJECT CONDITIONS

A. Coordinate the work with downspout discharge pipe inlet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Gutters and Downspouts:

1. ATAS International, Inc: www.atas.com
2. Cheney Flashing Co: www.cheneyflashing.com
3. Perimeter Systems: www.saf.com/persys
4. Petersen Aluminum Corporation: www.pac-clad.com
5. Alcoa: www.alcoahomes.com/protools
6. Substitutions: See Section 01600 - Product Requirements.

2.2 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.

1. Finish: Full-strength fluoropolymer, 1.0 mil total dry film thickness.
2. Color: To match standing seam metal roofing.

2.3 COMPONENTS

A. Gutters: rectangular style profile as indicated on drawings.

B. Downspouts: Rectangular profile as indicated on drawings.

C. Anchors and Supports: Profiled to suit gutters and downspouts.

1. Anchoring Devices: Type recommended by fabricator.
2. Gutter Supports: Brackets.
3. Downspout Supports: Brackets.

2.4 ACCESSORIES

A. Splash Pads: Provide precast concrete type at each downspout. Size, profiles to suit gutter and downspouts; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.5 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; solder watertight.

2.6 FACTORY FINISHING

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

D. Verify that surfaces are ready to receive work.

3.2 PREPARATION

A. Install starter strips, edge strips, and cleats before starting installation

B. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams soldered watertight. Flash and solder gutters to downspouts and accessories.

C. Secure gutters and downspouts in place using concealed fasteners.

D. Slope gutters 1/8" per foot minimum.

E. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

F. Set splash pads under downspouts in indicated locations. Secure in place.

END OF SECTION 076310

SECTION 077233 - ROOF HATCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide factory-fabricated roof hatches for ladder access.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data.

B. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.

C. Warranty: Submit executed copy of manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

A. Manufacturer: A minimum of 5 years experience manufacturing similar products.

B. Installer: A minimum of 2 years experience installing similar products.

C. Manufacturer's Quality System: Registered to ISO 9001 Quality Standards including in-house engineering for product design activities.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.5 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Type S-50TB Roof Hatch by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-535-1582, Web: www.BILCO.com.

2.2 ROOF HATCH

A. Furnish and install where indicated on plans metal roof hatch Type S-50TB, size width: 36" (914mm) x length: 30" (762mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

B. Performance characteristics:

1. Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
2. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m^2) with a maximum deflection of 1/150th of the span or 20 psf (97kg/m^2) wind uplift.
3. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
4. Operation of the cover shall not be affected by temperature.
5. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

C. Cover: Shall be 11 gauge (2.3mm) aluminum with a 5” (127mm) beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

D. Cover insulation: Shall be 3” (75mm) thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m^2K), fully covered and protected by an 18 gauge (1mm) aluminum liner.

E. Curb: Shall be 12” (305mm) in height and of 11 gauge (2.3mm) aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5-1/2” (140mm) flange with 7/16” (11mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6” (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

F. Curb insulation: Shall be 3” (75mm) thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m^2K).

G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

H. Hardware

1. Heavy stainless steel pintle hinges shall be provided
2. Cover shall be equipped with a spring latch with interior and exterior turn handles
3. Roof hatch shall be equipped with interior and exterior padlock hasps.
4. The latch strike shall be a stamped component bolted to the curb assembly.
5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1” (25mm) diameter red vinyl grip handle to permit easy release for closing.

6. All hardware shall be zinc plated and chromate sealed. [For installation in highly corrosive environments or when prolonged exposure to hot water or steam is anticipated, specify Type 316 stainless steel hardware].
7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

I. Finishes: Factory finish shall be mill finish aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

1. Test units for proper function and adjust until proper operation is achieved.
2. Repair finishes damaged during installation.
3. Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product data.

B. Samples: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.3 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of **250** g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. Sika Corporation; Joint Sealants.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. The Dow Chemical Company.
c. Tremco Incorporated.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. The Dow Chemical Company.
c. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Sherwin-Williams Company (The).
b. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

E. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

F. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

G.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Ceco Door; AADG, Inc.; ASSA ABLOY.
2. Curries, AADG, Inc.; ASSA ABLOY Group.
3. Republic Doors and Frames; a Allegion brand.
4. Steelcraft; Allegion plc.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings **and temperature-rise limits** indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

C. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Standard-Duty Doors and Frames: ANSI/SDI A250.8, Level 1; ANSI/SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule on Drawings.

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule on Drawings.
   b. Thickness: 1-3/4 inches.
   c. Face: Uncoated steel sheet, minimum thickness of 0.032 inch.
   d. Edge Construction: Model 1, Full Flush.
   e. Core: Manufacturer's standard .

2. Frames:

   a. Materials: Uncoated steel sheet, minimum thickness of 0.042 inch.
   b. Construction: Knocked down.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. [At locations indicated in the Door and Frame Schedule on Drawings] <Insert locations>.

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule on Drawings.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A40 coating.
   d. Edge Construction: Model 1, Full Flush.

e. Fire-Rated Core (Refer to drawings for locations/door counts): Manufacturer's standard vertical steel stiffener with insulation core for fire-rated doors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
b. Construction: Knocked down.
c.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **25** percent.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid core wood veneer-faced doors for a transparent finish.
2. Factory finishing flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door face type and characteristics.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Dimensions and locations of blocking for hardware attachment.
4. Requirements for veneer matching.

C. Samples: For factory-finished doors.

D. Specimen warranty.

E. Manufacturer's Installation Instructions: Indicate special instructions.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.4 WARRANTY

A. Interior Doors: Provide manufacturer's warranty for the life of the installation.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C orNFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 SOLID-CORE, FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors, Solid-Core Five-Ply Veneer-Faced:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Lynden Door, Inc.
b. Graham: GPD Series.
c. Marshfield Door System, Inc.
d. Substitutions: 016000 - Product Requirements.

2. Performance Grade: Premium.
3. Faces: Single-ply wood veneer not less than 1/50 inch thick.

a. Assembly of Veneer Leaves on Door Faces: Running match.

4. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

a. Fire-Rated Single Doors (refer to drawings for locations/door counts): Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.

5. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, Grade LD-1 particleboard.

1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Interior Doors, Solid-Core Five-Ply for Opaque Finish

B. Retain this article for traditional five-ply flush wood doors. Insert drawing designation, if applicable, for each product required. Use these designations on Drawings to identify each product.Retain "Manufacturers" Subparagraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.Retain "Performance Grade" Subparagraph below to specify performance grade if referencing WDMA I.S. 1A.First option in "Faces" Subparagraph below is highest quality. Coordinate with requirements of door grade selected.Retain option in "Exposed Vertical(and Top) Edges" Subparagraph below if top edges of doors are visible, such as doors in multistory spaces.Retain one of first four subparagraphs below. Particleboard cores are not generally recommended for exterior doors. In each of first two subparagraphs below, first option is for Extra Heavy Duty performance grade, second option is for Heavy Duty performance grade.Insert drawing designation, if applicable, for each product required. Use these designations on

1. Drawings to identify each product.Interior Doors, Solid-Core Five-Ply
2. Retain "Manufacturers" Subparagraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.Retain "Performance Grade" or "Performance Grade by Location" Subparagraph below to specify performance grade if referencing ANSI/WDMA I.S. 1A.Grade: Premium.

First option in "Faces" Subparagraph below is highest quality; last is most economical. Coordinate with requirements of door grade selected.Faces:

a. Mill Option Hardwood: Face veneer minimum 1/50 inch thickness at

moisture content of 12% or less.

b. Species: Clear Maple

c. Vertical Edges: To be the same species as face, grade A. Wood or composite material, one piece, laminated, or veneered Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

d. Horizonal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

Retain option in "Exposed Vertical(and Top) Edges" Subparagraph below if top edges of doors are visible, such as doors in multistory spaces.Retain one of first two subparagraphs below. Retain first subparagraph if steel edges and astragals are unacceptable. Coordinate availability and ratings with manufacturers. Retain second subparagraph if steel edges and astragals are acceptable.Retain last subparagraph above or first subparagraph below; delete option above if edges and astragals are field painted.Requirements in "Screw-Holding Capability" Subparagraph below are from WDMA I.S. 1A. Options are performance duty levels for Extra Heavy Duty, Heavy Duty, and Standard Duty, respectively. Before retaining, verify that products comply with requirement selected.Retain one or more of first four subparagraphs below.Consider deleting "Blocking" Subparagraph below. Some door manufacturers contend that blocking weakens particleboard-core doors and is not required. If retaining subparagraph, retain one of two options.If retaining "Blocking" Subparagraph and second option above, retain first three subparagraphs below for blocking required.Usually delete requirement for midrail blocking in last subparagraph above and retain first subparagraph below.In each of first two subparagraphs below, first option is for Extra Heavy Duty performance grade, second option is for Heavy Duty performance grade.Retain "Blocking for Mineral-Core Doors" Subparagraph above and first four subparagraphs below only after verifying availability for fire-protection rating required. Delete first four subparagraphs below if retaining first option above.Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit
abrasive planed before veneering.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.

B. Factory finish doors: Clear Maple Finish

C. Opaque Finish:

1. ANSI/WDMA I.S. 1A Grade: Premium.
2. Architectural Woodwork Standards System-5, Varnish, Conversion.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.

a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1) For factory-finished items, use filler matching finish of items being installed.

3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

    a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.

2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:

    a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
    b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
    c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    d. Comply with NFPA 80 for fire-rated doors.

5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance and storefront systems.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

1.3 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Field quality-control reports.

D. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Fabricator of products.

2. Entity that employs installers and supervisors who are trained and approved by manufacturer.
3. Authorized representative who is trained and approved by manufacturer.

B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in Arkansas [state] <Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

C. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and acceptable to Owner and Architect.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrance and storefront systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked-enamel, powder-coat, or organic finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Manufacturers: Basis of Design Product: Subject to compliance with requirements, provide Kawneer "Trifab Versaglaze 451/451T Framing System" or comparible product by one of the following: Aluminum entrances and storefronts shall be installed and completed by a single manufacturer and their representative.

1. EFCO Corporation.
2. Kawneer North America, an Arconic Company.
3. Vistawall.

4. United States Aluminum.
5. Oldcastle Building Envelope.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrance and storefront systems to withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8", whichever is smaller. [less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch] <Insert deflection limit>.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..

Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken .
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Black anodized aluminum finish
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Sealants: As recommended by manufacturer.

2.5 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.7 ALUMINUM FINISHES

A. Color Anodic Factory Finish: Kawneer Permanodic® AA-M10C21A44, AAMA 611, Architectural Class I Color Anodic Coating.

1. Color: #29 Black or as selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

B. Tests: Perform the following test on representative areas of aluminum-framed entrance and storefront systems.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect to be tested in accordance with AAMA 501.2 and to not evidence water penetration.

    a. Perform a minimum of two tests in areas as directed by Architect.

C. Aluminum-framed entrance and storefront systems will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Miscellaneous glazing materials.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

C. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Design Snow Loads: As indicated on Drawings.
2. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

C. Windborne-Debris-Impact Resistance: Exterior glazing shall pass ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 4 for basic protection.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located between 30 feet and 60 feet above grade.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

F. Acoustic Performance:

1. Exterior Glazing: 33 OITC.
2. Interior Glazing: 37 STC.

2.2 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. AGC Glass Company North America, Inc.
    b. Cardinal Glass Industries.
    c. Guardian Glass; SunGuard.
    d. Pilkington North America.
    e. Vitro Architectural Glass.

B. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. AGC Glass Company North America, Inc.
    b. Guardian Glass; SunGuard.
    c. Pilkington North America.
    d. Vitro Architectural Glass.

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.4 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Eastman Chemical Company.
    b. Kuraray America, Inc.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Aluminum with black, color anodic finish .

    a. Manufacturers: Subject to compliance with requirements, provide products by the following :

1) Technoform.
2) Thermix; a brand of Ensinger USA.

3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks:

1. EPDM with Shore A durometer hardness of 85, plus or minus 5.

C. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

D. Edge Blocks:

1. Type recommended in writing by sealant or glass manufacturer.

E. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.5 GLAZING SCHEDULE **(all exterior glazing will be tinted):**

A. GL-1: 1" Insulated tempered glazing

B. GL-2: 1" Insulated glazing

C. GL-3: 3/8" Tempered glazing

END OF SECTION

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silvered flat glass mirrors.
2. Film-backed glass mirrors qualifying as safety glazing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Binswanger Mirror; a division of Vitro America, Inc.
2. Guardian Glass; SunGuard.
3. Lenoir Mirror Company.
4. Trulite Glass & Aluminum Solutions, LLC.
5. Walker Glass Co., Ltd.
6. Substitutions: See Section 016000.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C1503; manufactured using copper-free, low-lead mirror coating process.

B. Annealed Monolithic Glass Mirrors: Mirror Select Quality, low-iron (low-iron) float glass with a minimum 91 percent visible light transmission.

1. Nominal Thickness: 4mm-6mm thick .

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Aluminum J Channel Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.

a. Manufacturers: Subject to compliance with requirements, provide products by the following :

1) Andscot Company, Inc.
2) C.R. Laurence Co., Inc.
3) Stylmark, Inc.

2. Aluminum J Channel Bottom Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.

2.5 FABRICATION

A. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts, so they fit closely around penetrations in mirrors.

B. Mirror Edge Treatment: **Edges to be rounded.**

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced National Glass Association (NGA) publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

C. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer and NGA's publication "Proper Procedures for Cleaning Flat Glass Mirrors."

END OF SECTION

SECTION 088700 - WINDOW FILM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following: Window Film to be installed in a pattern of varying widths on the demountable partitions specified in section 102217.

B. Related Sections include the following:

1. Division 8 Section "088000" Glazing for types of glass.
2. Division 10 Section "102217"Modular Partitions for demountable partition characteristics.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of window film indicated. Include product data, warranty information and installation / application instructions.

B. Shop Drawings: Show fabrication and installation details of window film pattern. Include elevations, details, and attachments to other Work.

C. Samples: Provide color charts as well as actual material samples of the film selected for final approval.

1.4 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of film specified

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: ¦ warranty information.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain window film through one source from a single manufacturer.

1.7 COORDINATION

A. Verification: Determine specific locations and pattern for installation of the window film on the glass demountable partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by the following as basis of design but other products of equal or better quality will be considered:

1. Decorative Films; www.decorativefilm.com

2.2 MATERIALS

A. Pressure sensitive vinyl film for interior and exterior use. Film comes in rolls of varying widths and lengths. Contractor to coordinate required widths with pattern indicated on the drawings.
1. Decorative Films product model# SOLYX SXJ-0547 Feather Gradient.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise installers when glazing has been set and is ready to receive window film.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing window film free of any defects in the required pattern.

B. ADJUSTING AND CLEANING

C. Insure that window film is properly attached, with no air bubbles under the surface, no visible seams, or other marks in the film application.

D. Remove and replace bubbled, delaminated, or otherwise damaged film.

END OF SECTION

SECTION 090561.13 - MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation.

1.2 DEFINITIONS

A. MVE: Moisture vapor emission.

B. MVER: Moisture vapor emission rate.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs factory-trained personnel who are available for consultation and Project-site inspection.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:

1. MVER: Maximum 15 lb of water/1000 sq. ft. when tested according to ASTM F1869.
2. Relative Humidity: Maximum 90 percent when tested according to ASTM F2170 using in situ probes.

B. Water-Vapor Transmission: Through MVE-control system, maximum 0.02 perm when tested according to ASTM E96/E96M.

C. Tensile Bond Strength: For MVE-control system, greater than 200 psi with failure in the concrete according to ASTM D7234.

2.2 MVE-CONTROL SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Advanced Moisture Control, Inc.
2. BASF Corp. - Construction Chemicals.
3. Floor Seal Technology, Inc.
4. Sch?nox, HPS North America, Inc.

B. MVE-Control System: ASTM F3010-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.

1. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.

2.3 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 3000-psi compressive strength after 28 days when tested according to ASTM C109/C109M.

B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.

PART 3 - EXECUTION

3.1 PREPARATION

A. Preinstallation Testing:

1. Testing Agency: Engage a qualified testing agency to perform tests.
2. Alkalinity Testing: Perform pH testing according to ASTM F710. Install MVE-control system in areas where pH readings are less than 7.0 and in areas where pH readings are greater than 8.5.
3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. in 24 hours.
b. Internal Relative Humidity Test: Using in situ probes, ASTM F2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.

4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. area of MVE-control system to prepared concrete substrate and test according to ASTM D7234.

a. Proceed with installation only where tensile bond strength is greater than 200 psi with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.

3.2 INSTALLATION

A. Install MVE-control system according to ASTM F3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.

1. Install primers as required to comply with manufacturer's written instructions.

B. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.

C. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.

D. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.

E. Install cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

F. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.

G. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Texture finishes.

1.2 ACTION SUBMITTALS

A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. American Gypsum.
b. Certainteed; SAINT-GOBAIN.
c. Georgia-Pacific Gypsum LLC.
d. USG Corporation.

2. Thickness: 5/8 inch .
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated in accorance with ASTM D3274.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Certainteed; SAINT-GOBAIN.
    b. Georgia-Pacific Gypsum LLC.
    c. USG Corporation.

2. Core: 5/8 inch, Type X.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use [setting-type taping] [drying-type, all-purpose] compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound drying-type, all-purpose compound high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

1. Sealant shall have a VOC content of 250 g/L or less.

D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested in accordance with ASTM E84.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Georgia-Pacific Gypsum LLC.
    b. National Gypsum Company.
    c. USG Corporation.

2. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

3.2 FINISHING OF GYPSUM BOARD

A. Prefill open joints, rounded or beveled edges, and damaged surface areas.

B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

C. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

4. Level 5: Vestibule, Hall, and Office Entry/Reception Area. .

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

D. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.3 APPLICATION OF TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Glazed wall tile.
3. Stone thresholds.
4. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide samples of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.

3. Installer employs only Ceramic Tile Education Foundation Certified Installers for Project.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS (Refer to drawings)

A. Tile-1 - Porcelain Floor Tile Type 1

1. Manufacturer: Subject to compliance with requirements, provide products by the following:

a. Basis of Design: Daltile Volume 1.0, Sonic White VL75: www.daltile.com

1) Finish: Matte
2) Tile Size: 12 x 24
3) Thickness: 5/16
4) Cove Base to match: 6 x 12, Model #P36C9
5) Grout: To be selected from manufacturer’s full range of colors. Color Selected: Laticrete, 35 Mocha

b. Basis of Design: Daltile Uptown Glass, Posh Bronze Hexagon UP29: www.daltile.com

1) Finish: Mixed
2) Tile Size: 11 3/4 “ x 11 ½”
3) Thickness: 4.4mm
4) Cove Base to match: 6 x 12, Model # P36C9 verify
5) Grout: To be selected from manufacturer's full range of colors. Color Selected: Laticrete, 35 Mocha

B. Tile-1 - Porcelain Floor Tile Type 2

1. Manufacturer: Subject to compliance with requirements, provide products by the following:

a. Basis of Design: Daltile Uptown Glass, Posh Bronze Hexagon UP29: www.daltile.com

1) Finish: Mixed
2) Tile Size: 11 3/4 " x 11 ½"
3) Thickness: 4.4mm
4) Grout: To be selected from manufacturer's full range of colors. Color Selected: Laticrete, 35 Mocha

C. Tile- (Accent 1) – Porcelain Wall Tile Type 1

1. Manufacturer: Subject to compliance with requirements, provide products by the following:

a. Basis of Design: Daltile Remedy, Alchemy Rectangle RD25; www.daltile.com

1) Finish: Glossy
2) Tile Size: 2 x 10
3) Thickness: 3/8"
4) Grout: To be selected from manufacturer's full range of colors. Color selected: Laticrete, 22 Midnight Black.

D. Tile (Accent 2) – Porcelain Wall Tile Type 2

1. Manufacturer: Subject to compliance with requirements, provide products by the following:

a. Basis of Deign: Daltile Remedy, Elixir Rectangle RD20.

1) Finish: Glossy
2) Tile Size: 2 x 10
3) Thickness: 3/8"
4) Grout: to be selected from manufacturer's full range of colors. Color selected: Laticrete, 40 Latte

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Custom Building Products.
b. Georgia-Pacific Gypsum LLC.
c. USG Corporation.

2.5 SETTING MATERIALS

A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

1. For wall applications, provide nonsagging mortar.

2.6 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. MAPEI Corporation.

2. Polymer Type:

a. Dry, redispersible form, prepackaged with other dry ingredients.
b. Liquid-latex form for addition to prepackaged dry-grout mix.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Schluter Systems L.P.

        1) Top of Tile Wall Tile to Wall Transition: Schluter - JOLLY (top and outside edge)
        2) Floor Tile to Concrete Floor Transition: Schluter - RENO-RAMP/-K.
        3) Tile to Stair Nosing Transition: Schluter-TREP-E (Deductive Alternate #)

C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Custom Building Products.
    b. Laticrete International, Inc.

D. Stone Underlayment (Deductive Alternate #) - Install only on second floor under porcelain tile in it's entirety.

1. Basis-of-Design: EasyMat Tile & Stone Underlayment. www.custombuildingproducts.com

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile floors consisting of tiles 8 by 8 inches or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Wall Tile: 1/16 inch.
2. Porcelain Tile: 1/4 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in mortar (thinset).

K. Metal Edge Strips: Install at locations indicated.

L. Floor Sealer: Apply floor sealer to[cementitious] grout joints[in tile floors] according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

M. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

N. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

O. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION

SECTION 095000 - ACOUSTICAL METAL CEILINGS

Part 1 - General

1.1 RELATED DOCUMENTS

A. Section Includes

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section

1.2 SUMMARY

A. Section Includes

1. Acoustical metal ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Sections:

1. Section 092900 - Gypsum Board
2. Divisions 23 - HVAC Air Distribution
3. Division 26 - Electrical

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
10. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
12. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code
C. ASHRAE Standard 62 1 2004 Ventilation for Acceptable Indoor Air Quality
D. NFPA 70 National Electrical Code
E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
G. International Code Council-Evaluation Services Report - Seismic Engineer Report
1. ESR 1308 - Armstrong Suspension Systems
H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report
1. 0244 - Armstrong Single Span Suspension System
I. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010
J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings
K. International Well Building Standard
L. Mindful Materials
M. Living Building Challenge
N. U.S. Department of Agriculture BioPreferred program (USDA BioPreffered).

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.
D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be

required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

a. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

C. Acoustic Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection en gineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure:

Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F (49°C) and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire

Guard XL suspension systems. Products with Humiguard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.

1.9 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical Metal panels: One (1) year from date of substantial completion
2. Grid: Ten (10) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal Ceiling Panels:

1. Armstrong World Industries, Inc.; Product Metalworks Linear #5490

B. Suspension Systems:

1. Armstrong World Industries, Inc. (see items# below and manufacturer to verify exact quantities and systems required)

C. Aluminum Custom Trims:

1. Armstrong World Industries, Inc.

2.2.1 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type MT

1. Acoustical Panels Type MT (Metal Panel System):
    a. Surface Texture: Smooth
    b. Composition: Metal
    c. Color: Effects Sesame
        1) Interior (FXSE)
        2) Exterior (FXSE2)
    d. Size: 4 in x 96 in lengths

e. Edge Profile: Square with extended flange
f. Perforation Option: Unperforated (M1)
g. Flame Spread: ASTM E 1264; Class A (FM).
h. Light Reflectance (LR) White Panel: ASTM E 1477; 0.77.
i. Dimensional Stability: Standard
j. Recycle Content: Post-Consumer - 0% Pre-Consumer - 25%
k. Acceptable Product: METALWORKS Linear, 5490 No added formaldehyde as manufactured by Armstrong World Industries
l. Available for exterior applications, tested to meet wind uplift Classes 30, 60, and 90

2. Metal Panel Accessories:
   a. 5581 - 4" Panel End Cap (verify)

3. Suspension Systems (interior/exterior)
   a. Item #7177 - Main beam carrier assembly – G90 Mill Finish
   b. Item #XL8945P – 4’ Drywall Cross Tee – Interior Only
   c. Item #XL8945G90 – FrameAll 4’ Drywall Cross Tee
   d. Item #XL7936G90 – 3” Drywall Cross Tee – Exterior
   e. Item #XL9826G90 – 2’ Drywall Cross Tee – Exterior

4. Other Accessories:
   a. Item 7237 – Cut Plank Support Bracket
   b. Item 5494 – Contrast Filler Strip

5. Splice Plates:
   a. Item 8159 – 2” Panel Splice
   b. Item 5495 – 4” Panel Splice
   c. Item 7163 – 6” Panel Splice
   d. Item 5496 – 8” Panel Splice

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions
B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.
F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles.
2. Metal suspension system.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Attic Stock: Furnish to the owner two unopened boxes of ceiling tile for their future use. Store tiles as directed by the owner. Attic stock is not to be used to correct punch items or fix leaks during project closeout or the one year warranty period unless the contractor replaces the tile they use to make repairs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance (if applies in building zone - verify): Suspended ceilings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL TILES (ACT)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis of Design Product: Subject to compliance with requirements, provide Armstrong Ultima 2 x 2 beveled tegular edge, with 9/16" grid for ACT type 1 or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Certainteed; SAINT-GOBAIN.
3. USG Corporation.

C. Color: White .

D. Ceiling Attenuation Class (CAC): 35.

E. Noise Reduction Coefficient (NRC): 0.75.

F. Edge/Joint Detail: Beveled Tegular .

G. Thickness: 3/4 inch.

H. Modular Size: 24" x 24" .

2.3 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis of Design Product: Armstrong 9/16" ceiling grid system or comparable product by one of the following:

1. Armstrong Ceiling & Wall Solutions.
2. USG Corporation.

C. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, fully concealed, metal suspension system that complies with applicable requirements in ASTM C635/C635M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. Install suspended acoustical tile ceilings in accordance with ASTM C636/C636M[, seismic design requirements,] and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

C. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plans.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.
2. Rubber molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 ATTIC STOCK

A. Include 5% of total overall rubber base material color and type.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Armstrong World Industries, Inc.
2. Johnsonite; A Tarkett Company.
3. Roppe Corporation, USA. (Basis of Design)

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style B, Cove: Refer to finish schedule.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: To be selected by Architect from manufacturer's full range of colors. Color selected: 129 Dolphin by Ropper 700 Series.

2.2 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by the following: Same manufacturer as the cove base. :

B. Description: Rubber transition strips.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.

C. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. All flooring materials and adhesives shall be delivered to the job site at a minimum of 48 hours prior to installation. Materials shall arrive to job site a miminum of 96 hours when relative humidity is above 65% or below 45%.

1.6 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's standard limited warranty.

1.7 EXTRA MATERIALS

A. Attic Stock: Provide Owner 1 unopened carton of each color and type specified.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE

A. Products: Subject to compliance with requirements, provide the following:

1. Armstrong World Industries, Inc
2. Johnsonite; A Tarkett Company.
3. Basis of Design Product: Mannington Mills, Inc; Mannington Commercial Natural Optimist
4. Shaw Contract Group; a Berkshire Hathaway company.

B. Tile Standard: ASTM F 1700.

1. Class: Class III, Printed Film Vinyl Tile.
2. Type: B, Smooth Surface .

C. Thickness: 0.1575 inch (20 mil wear layer thickness)

D. Size: 18” x 18”.

E. Colors and Patterns: LVT: Springhouse Teak, NAT108 (Natural Optimist) by Manning Commercial. Refer to finish plan and schedule for LVT patterns and locations. Coordinate with architect the direction of the tile pattern.

2.2 TRANSITIONS (refer to drawings for locations)

A. Transitions types:

1. Use Schluter RENO-T for existing same height, hard surface floor covers for retrofit applications. www.schluter.com
2. Use Schluter, VINPRO-S for LVT/LVT resilient surface edge protection profile with minimal reveal. www.schluter.com

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Extra Materials: Contractor to provide two unopened boxes of each carpet tile used on the project. Attic stock to be stored as directed by the owner at project turnover.

1.5 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT-1)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis of Design: Patcraft; a division of Shaw Industries, Inc.

C. Color: ABRACADABRA 00110, Collection: Easy on the Eyes 10227 by Patcraft or As selected by Architect from manufacturer's full range.

D. Pattern: Quarter Turn (Coordinate final layout with Architect before installing and manufacturer’s recommendations) .

E. Pile Characteristic: Multi-Level Pattern Loop .

F. Pile Thickness: 0.113 Inches (2.87 MM) .

G. Gage: 1/10 inches (39.37 per 10 CM) .

H. Total Weight: 18 oz/yd square

I. Primary Backing/Backcoating: Non-woven Synthetic

J. Secondary Backing: ECOWORK TILE.

K. Size:24 by 24 inches.

L. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.

2.2 WALKOFF CARPET

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis of Design: Patcraft; a division of Shaw Industries, Inc

C. Color: Radius 00700; Collection: Deconstructed Form – Graphic Arc 10597 by Patcraft or selected by Architect full range of colors.

D. Pattern: Various patterns (Coordinate final layout with Architect before installing and manufacturer’s recommendations).

E. Pile Characteristic: Multi-level pattern cut/loop.

F. Pile Thickness: 0.331 inches

G. Fiber: ECOSOLUTION Q100 NYLON

H. Gage: 110 inches

I. Total Weight: 37 oz/yd square

J. Primary Backing/Backcoating:

K. Secondary Backing: ECOWORX TILE

L. Size: 18” x 36”

M. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs:

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

B. Wood Subfloors: Verify that underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

C. Metal Subfloors: Verify that underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.

1. Access Flooring Systems: Verify access floor substrate is compatible with carpet tile and adhesive, if any, and underlayment surface is gaps greater than 1/8 inch and protrusions more than 1/32 inch.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

I. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Primers.
2. Steel and Iron

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benjamin Moore & Co.
2. PPG Paints.
3. Sherwin-Williams Company (The).

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Nonflat Paints and Coatings: 50 g/L.
2. Primers, Sealers, and Undercoaters: 100 g/L.
3. Rust-Preventive Coatings: 100 g/L.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS

A. Exterior, Alkali-Resistant, Water-Based Primer: Pigmented, water-based primer formulated for use on alkaline surfaces, such as exterior plaster, vertical concrete, and masonry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers.

B. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.

3.3 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions.

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Water-Based, Light Industrial Coating System <Insert drawing designation>:

a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
b. Prime Coat: Primer, rust inhibitive, water based MPI #107.
c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

2. Ferrous Metals, Unprimed, Alklyd, 3 Coat.

a. One coat of alkyd rust primer.

b. Topcoat: Second and Third Coat Exterior Alkyd Semi-Gloss Paint.

3. Galvanized Metals, Alkyd enamel, 3 Coat. Pretreatment Chemical Wash.

a. One coat galvanized iron primer.
b. Topcoat: Second and Third Coat Exterior Alklyd Semi-Gloss Paint.

4. Aluminum Paint System MPI EXT 5.1 K:

a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
b. Prime Coat: Shop primer specified in Section where substrate is specified.
c. Topcoat: Second and Third Coat Exterior Alkyd Semi-Gloss Paint.

B. Stainless-Steel Substrates:

1. Water-Based Light Industrial Coating System MPI ECT 5.6G.

C. Structural Steel (3 coat) Semi-gloss finish:

1. First Coat: Acylic Primer
2. Second and Third Coat Acrylic Urethane.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel and Iron
2. Wood
3. Gypsum Board
4. Dry fall coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benjamin Moore & Co.
2. PPG Paints.
3. Sherwin-Williams Company (The).

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.

C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Fiber-Cement Board: 12 percent.
2. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Other items as directed by Architect .

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Latex System, Alkyd Primer MPI INT 5.1Q (Water based Acrylic Latex) :

a. Prime Coat: Alkyd, anti-corrosive, for metal, MPI #79. .
b. Prime Coat: Shop primer specified in Section where substrate is specified.
c. Topcoat: Semi-Gloss door frames.

2. Wood Substrates: Wood Trim:

a. Prime Coat: Primer System MPI INT 6.3T (Water based Acrylic Latex):

3. Latex over Shop-Applied Quick-Drying Shop Primer System <Insert drawing designation>:

    a. Intermediate Coat: Latex, interior, matching topcoat.
    b. Topcoat: Interior, latex, flat (MPI Gloss Level 1, MPI #53).
    c.

B. Spray-Textured Ceiling Substrates:

1. Alkyd over Alkyd Sealer System <Insert drawing designation>:

    a. Topcoat: Interior, alkyd, [flat] [eggshell] [semigloss] [gloss].

C. Spray-Textured Ceiling Substrates:

1. Latex, Flat System: Spray applied MPI INT 9.1A: Spray applied drawing designation:

    a. Prime Coat: Primer, Latex, for interior wood, MPI #39.
    b. Intermediate Coat: Latex, interior, matching topcoat.
    c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53

D. Gypsum Board Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A: :

    a. Prime Coat: Primer sealer, latex, interior, MPI #50
    b. Prime Coat: Latex, interior, matching topcoat
    c. Intermediate Coat: Latex, interior, Matching topcoat.
    d. Topcoat: . Latex, interior (MPI Semi-Gloss Level 4 finish w/light orange peel
    finish), MPI #43. Minimum of 2 finish coats.
    e. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5 finish (surfaces exposed to grazing light (corridors, etc), MPI #54. Minimum of 2 finish coats.

END OF SECTION

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach to floor mounted to overhead-bracedstructural system toilet compartments.
2. Section 061000 "Rough Carpentry" for overhead support to side wall bracing/blocking. .
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

1. Plans, elevations, sections, details, and attachment details.

C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Product shall be made without urea formaldehyde.

B. Product shall have formaldehyde emission rates not greater than 0.09 ppm when tested according to ASTM D 6007 or ASTM E 1333.

C. Product shall be made without urea formaldehyde.

D. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

E. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Basis of Design: Hiny Hiders Toilet Partitions by Scranton Products; www.scrantonproducts.com .

B. Toilet-Enclosure Style: Overhead braced and Floor anchored.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, and Pilaster Construction: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch- thick panels. Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door (unless continuous hinge is used).

1. Color: Color to be Linen or as selected by Architect from manufacturer's full range of colors.

E. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

F. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

G. Urinal-Screen: Manufacturer's standard monolithic phenolic-core urinal screen with a braced secured to the wall.

H. Phenolic Compartment Finish: One color in each room.

2.3 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. Mount with through bolts.

1. Hinges: Manufacturer's stainless steel, surface-mounted, paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
2. Latch and Keeper: Manufacturer's standard stainless steel, surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
3. Coat Hook: Manufacturer's standard stainless steel combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard stainless steel, rubber-tipped bumper at outswinging doors.
5. Door Pull: Manufacturer's standard stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

B. Floor Bracing with headrail brackets fasten to wall brackets : Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

2.5 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet enclosures and 36-inch- wide, outswinging doors with a minimum 32-inch- wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

    a. Pilasters and Panels or Screens: 1/2 inch.
    b. Panels or Screens and Walls: 1 inch.
2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.

    a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102217- MODULAR PARTITIONS

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Modular partitions framing;
.2 Glass and glazing;
.3 Doors and door hardware;
.4 Accessories.
.5 Finishes.

.2 Related Sections:

.1 Base Building Documents:

.1 Division 08 Doors and Door Hardware.
.2 Division 09 Finishes.
.3 Division 26 Electrical.
.4 Division 28 Electronic Safety and Security

1.2 REFERENCES

.1 American Architectural Manufacturers Association (AAMA):

.1 AAMA 61198 Voluntary Standards for Anodized Architectural Aluminum.

.2 American Society of Civil Engineers (ASCE):

.1 ASCE-7 Minimum Design Loads for Buildings and Other Structures.

.3 ASTM International:

.1 ASTM E72 Method for Conducting Strength Tests of Panels for Building Construction.
.2 ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
.3 ASTM E90 Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
.4 ASTM E413 Classification for Rating Sound Insulation.

.4 CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 PERFORMANCE REQUIREMENTS

.1 Structural Performance: Modular partitions shall be capable of withstanding the effects of gravity loads, dead loads, and the following loads and stresses within limits and under conditions indicated:

.1 Transverse Load: Lateral deflection of the overall span when tested under a uniformly distributed load of 5 psf (0.24 kN/m2) in accordance with ASTM E72 where L = modular partition wall height:

.1 Solid Walls: not more than L/120;
.2 Glass Walls: not more than L/175 or 3/4 inch (19 mm) which ever is more stringent.

.2 Mechanical Strength: Capable of withstanding static loads in accordance with ANSI/BIFMA X5.6.

.3 Seismic Performance: Provide modular partitions capable of withstanding effects of seismic motions determined according to the currently adopted building codes.

.2 Acoustical Performance: Where STC ratings are indicated, provide partitions with STC rating determined by testing an identical system to ASTM E90 and classified in accordance with ASTM E413.

.1 Sound Transmission Coefficient (STC) range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with ASTM E90 and ASTM E413 for frequency data. Tested assembly shall have been assembled in the same manner the modular partitions to be installed on the project.

.2 Test results vary based on glass or solid wall configuration, and implementation of perimeter enhancements at base building connections.

.1 Solid wall results range up to 50 STC performance.
.2 Glass wall performance is limited by the glass specified. Coordinate requriements with the modular partition manufacturer.

.3 Fire Resistance:

.1 Surface-Burning Characteristics: Tested in accordance with ASTM E84 by a qualified independent testing agency.

.2 National Building Code of Canada, CAN/ULC-S102 Surface Burning Characteristics of Building Materials and Assemblies.

.4 Coordination Requirements:

.1 Comply with Division 01 project management and procedures.

.2 Project Scheduling and Lead Times: Manufacturing production time of all standard products and finishes shall not exceed five weeks, inclusive of shipping within US and Canada, from manufacturer's receipt of complete order information (including shop drawing approval, deposit cost, and notice to proceed).

.1 Maximum delivery time on solutions included on GSA contracts shall not exceed 45 days. Coordinate adjacent work, including other work by others to be installed within or next to Work of this section.

.3 Schedule: Coordinate delivery with construction schedule to avoid storage or double handling of the modular partition system.

.4 Install modular partition system after the building is enclosed and conditioned including completion of HVAC equipment, fire suppression system, lighting, adjacent ceilings and base building finishes in a sequence that allows final electrical connection, voice data/communications to be completed during or after installation of the modular partition systems.

.1 Coordinate modular partition installation with ceiling, floor finish, and specified wall base (modular partition standard base, applied base, or integral base installation).

.5 Floor and base finishes may be completed before installation of modular partition system unless coordinated with the manufacturer ahead of time through the Shop Drawing process.

1.4 SUBMITTALS

.1 Product Data:

.1 Provide manufacturers standard product information for each type of product indicated.

.2 Shop Drawings:

.1 Provide manufacturer's architectural plans, elevations, sections, connection and attachment details, finish schedule, reflected ceiling plans, doors and hardware schedule, electrical and mechanical requirements, schedules, and locations.
.2 Provide manufacturer with product data, fabrication drawings, schematics and similar information for data, security, or communications to be embedded within or supported by modular partitions.
.3 Include field measurements of existing construction, future construction, finished width and height of partitions and associated components.

.1 Manufacturer's authorized representative shall undertake field measurements to show relevant adjacencies in Shop Drawings. Site conditions, base building construction, and required clearances are to be reviewed and approved by the Architect, including exiting, life safety, location of building service devices, and other affected trades through Shop Drawings to identify and prevent potential conflicts.
.2 Where field measurements are not possible, hold-to and control dimensions must be coordinated and agreed upon by all parties through the Shop Drawing process before manufacturing begins.

.3 Coordination Drawings:

.1 Provide shop drawings for coordination between trades upon request.
.2 Provide architectural plans locating modular partitions within the base building, including finishes and construction of surfaces the modular partition system will interface with or connect to.

.4 Samples: Provide manufactures standard size samples for verification of support system and each type, color, and texture of exposed finish, full thickness and the following minimum sizes:

.1 Extrusion Components.
.2 Linear Trim and Base.
.3 Door Face Finishes.
.4 Glazing.

.5 Provide product data sheets for all types of Hardware and Accessories.

.6 Maintenance Data: Provide maintenance data for incorporation into operation and maintenance manuals.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer Qualifications: Manufacturer shall specialize in designing and manufacturing modular partitions of the quality and complexity required for this project with a minimum of 10 years documented successful experience. Manufacturer shall have production facilities capable of meeting contract requirements for single-source responsibilities and warranty.
.2 Installer Qualifications: Certified by the manufacturer.

.2 Pre-Installation Conference:

.1 Meet at the project site minimum 1 week prior to Shop Drawing approval and prior to beginning installation. Meeting shall include authorized representatives of the Owner, Architect, base building contractor and all trades whose work will interface with installed systems.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Do not deliver or install modular partitions until spaces are enclosed and weather-tight, wet work is complete and dry, work above ceilings is complete, and HVAC system is operational and able to maintain ambient temperature and humidity conditions at occupancy levels for the remainder of the construction period.

.2 Ship system components in manufacturer's standard packaging. Maintain air circulation during shipment. Do not allow packaging to get wet or develop condensation.

.3 Deliver materials to project site or offsite warehouse as directed by the Contractor or Owner as applicable, and in accordance with the manufacturer's instructions in original unopened and undamaged packages. Packages shall be labeled with manufacturers name, brand names, size, finishes, and placement locations.

.4 Store in a clean, dry, secure space to protect from damage during construction activities. Minimize or eliminate storage period by coordinating with construction schedule.

.5 Handle in accordance with the manufacturers instructions.

1.7 PROJECT CONDITIONS

.1 Environmental Limitations: Do not deliver or install system and components until building is enclosed and finishing operations are complete, including adjacent ceiling and floor covering installation and painting.

.2 Temperature and humidity shall be maintained to final occupancy standards. Installation areas shall be climate controlled between 60 and 90 degrees F (15.5 and 32.2 C) with Relative Humidity maintained between 25 and 55 percent.

1.8 WARRANTY

.1 Provide manufacturers standard, limited, transferable warranty executed in the name of the Owner. Guarantee the site assembled modular structure, panel system and components are free from defects in material and workmanship.

.1 Warranty Period, Modular Partition System: 10 year limited warranty.

Part 2 Products

2.1 MANUFACTURERS

.1 DIRTT Environmental Solutions;

.1 Website: www.dirtt.net
.2 GSA Schedule:

.1 Contract: GS 07F 0005T.
.2 CCR#: 73193726.

.2 Substitutions: Not permitted without demonstrating compliance with aesthetic effects shown in the drawings, performance requirements and lead times specified above.

2.2 SYSTEM DESCRIPTION

.1 Factory assembled, site installed, moveable, demountable, reusable interior solid and glazed partitions, including structure, face mounted finished tiles, modular and non-modular metal framing and doors to accept a variety of millwork, finishes, building services components, technology, and accessories.

.2 System is floor-supported, floor-to-ceiling site constructed in configurations shown on the Shop Drawings. Top channels hold modular partitions in place and accommodate height adjustments to suit floor-to-ceiling dimensional variations and similar site specific requirements.

.1 Where modular partitions are not clipped to ceilings or other overhead construction, additional structural review and system engineering will be required by the manufacturer.

.3 Partially Unitized Solid Wall system shall be comprised of modular components which can be disassembled, relocated / field cut and substantially reused.

2.3 MODULAR PARTITIONS FRAMING

.1 Framing for Glazed Partitions:

.1 Material: Aluminum extrusions, 6063T6 aluminum alloy, thickness engineered to meet performance requirements specified above.

.2 Vertical Support Spacing: Customized spacing as shown on the drawings. Max spacing is 60in.
.3 Ceiling Track: Continuous, with intermittent breaks for pass through of building services or structural components.
.4 Floor Track: Modular with wall frames inclusive of carpet grippers or floor tape (non-seismic) or continuous with floor anchor attachment (seismic) stopped at doorways and pass-throughs.
.5 Bracing: as required to meet structural performance.
.6 Fasteners: Zinc Plated Steel Type F Screws unless otherwise indicated on engineered shop drawings.

.2 Frame Bases:

.1 Provide frame bases with provisions for 1-1/2 inch (38.1 mm) height adjustment to accommodate floor slab variances.
.2 Provide a leveling mechanism for making fine adjustment in height over adjustment range of the product.

2.4 GLASS AND GLAZING

.1 Typical: Tempered glass minimum thickness 6 mm (1/4 inch) to ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type 1, Class 1 (transparent), Quality q3.

.2 Glass Types:

.1 Glass Type GLS-1: **3/8" (10mm) Tempered** as specified **in Division 08 "Glazing"**.

2.5 DOORS AND DOOR HARDWARE

.1 General:

.1 Coordinate security system components to be provided by others with Modular partitions manufacturer through the Shop Drawing process.

.2 Frameless Glass Sliding Door: Manufacturer's supplied top rail and bottom aluminum rails (glass supplied locally by others).

.1 Door Glazing: 3/8 inch (10 mm) tempered glass supplied locally by others.
.2 Stile Width: None.
.3 Top Rail Height: 2-3/8 inch (61 mm).
.4 Bottom Rail: 5 inch (127mm) AFF.

.1 Provisions for ADA bottom rails as determined by the design professional of record.

.5 Hardware Reinforcement: Factory milled by modular partition manufacturer to suit glass and hardware supplied by others as shown on show drawings.
.6 Security System Components: Coordinate security system requirements and components to be provided by others with modular partitions manufacturer

through the shop drawing process.

2.6 DOOR FRAMES

.1 Sliding Door Frames: Manufacturer's standard aluminum frame single door, single continuous track mounted to demountable wall system and capable of reconfiguration without part replacement or damage to wall components.

.1 Door Module Size: **3'-4"wide (refer to drawings)**
.2 Finished door width is equal to module width plus 1/4 inch (6 mm).
.3 Configuration: Header, jambs and pivot hardware. Single door frame width not to exceed 1524 mm (60 inch) wide module for Aluminum Doors and 1219mm (48inch) for Wood Doors.
.4 Self supporting header and track, jambs, sliding door, and trackless at floor between jambs.
.5 Frame Height: Jambs shipped over length by 50 mm (2 inches) in height, for field cutting to suit opening height for proper alignment with adjacent frames.
.6 Factory notched and drilled jambs for ceiling track and manufacturer's standard header attachment.
.7 Extrusion Profile: **Curvilinear** profile to match any adjacent unitized glass frames.
.8 Frame and Track Construction:

.1 Continuous extruded frame supported or drywall header section with concealed track mechanism.
.1 Guide and alignment hardware for stabilization of door bottom.
.2 Door secured in closed position on strike side of door.
.3 Anti rack / lift hardware included in track assembly.

.9 Operation:

.1 Soft lose mechanism for door weights of 165 pounds (75 kg) or less.
.2 Pneumatic slow down mechanism for door weight of 165 to 200 pounds (75 to 90 kg).

.10 Seals: continuous acoustical seals on strike and guide side. Manufacturer's standard.
.7 Operation and configuration ADA compliant in both clear opening as determined by design professional of record.

.2 Hardware: Manufacturer's standard **sliding door** hardware, with **30" pulls**.

2.7 ACCESSORIES

.1 Connections and Supports: Manufacturer's standard connections and supports that connect and release from floor and ceiling without damage using carpet grippers and ceiling track clips, with exception of the following conditions: bulkhead (drywall ceiling), seismic conditions, electrical or service feeds, physical connections to base building (where required).
.2 Panel Joint Closure: Manufacturer's standard, capable of closing up to a 25 mm (1 inch) gap between demountable partitions and base building elements.
.3 Trim: Continuous and modular, factory finished, snap on type; field cuttable for variations in floor and ceiling levels.

.1 Base Trim Profiles: Recessed; removable to access leveling mechanisms.
.2 Ceiling Trim Profile: Recessed; adjustable to accommodate up to a 12 mm (1/2 inch) gap between demountable partitions and base building elements.
.3 Wall Trim Profile: Recessed; adjustable to accommodate up to a 12 mm (1/2 inch) up to 25 mm (1 inch) gap between demountable partitions and base building elements.
.4 Tile to Tile Profile: As detailed.
.5 Colours: As selected by Architect from manufacturer's full range.

2.8 FABRICATION

.1 Components:

.1 Fabricate components for installation with concealed fastening devices and pressurefit members that will not damage ceiling or floor coverings. Exceptions: Drywall ceiling, seismic applications and doors against base building require screw holes in base building for proper fastening.
.1 Fabricate for installation with manufacturer’s standard seals at floor and other locations where partition assemblies abut fixed construction and for installation of sound attenuation insulation in partition cavities.

2.9 FINISHES

.1 Protect finishes on exposed surfaces from damage during shipping.
.2 Appearance of Finished Work:

.1 Finishes shall match approved samples.
.2 Variations in natural finishes such as stone and wood shall be reviewed and accepted in accordance with industry standards.

.3 Frame Finishes:

.1 Aluminum extrusions are powder coated in textured, metallic, or smooth finishes. Color to be Black or selected by architect from manufacturer’s full range of colors.

.4 Door Finishes:
.1 Aluminum extrusions are powder coated in textured, metallic, or smooth finishes. Color to be Black or selected by architect from manufacturer’s full range of colors.

Part 3 Execution

3.1 EXAMINATION

.1 Verify field or hold-to control dimensions before fabrication of modular partitions. Coordinate fabrication schedule with construction schedule and progress to avoid delay in the work.

.2 Examine all adjoining work including work by others. Do not proceed with fabrication or installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

.3 Locations to receive modular partitions shall be inspected for compliance with manufacturer's requirements.

.4 Site floor conditions must be surveyed to determine the nature of floor level and determine where special conditions exist beyond manufacturer's standard leveling capabilities of 1-1/2 inch in 4'-0" (38.1 mm in 1219 mm).

.5 Field conditions and pre-existing installations by others which may adversely affect installation or exceed the manufacturer's limitations shall be corrected before installing modular partitions.

3.3 INSTALLATION (TYPICAL PROCESS)

.1 Installation of modular partitions system shall be completed by a manufacturer certified installer.

.2 Install system level, plumb, and aligned.

.3 All building services shall be installed and connected to the base building systems by licensed sub trades. All building services shall be inspected by authorized trade representatives and Authority Having Jurisdiction in the presence of a manufacturer representative. Coordinate with all affected parties as required.

.4 Installation sequence as determined by the certified installer and coordinated with the General Contractor based on project conditions.

3.4 CLEANING

.1 Upon completion of installation, modular partition components and finishes shall be cleaned in accordance with the finish manufacturer's instructions. Alkaline or abrasive agents shall not be used. Avoid scratching or marring finishes.

3.5 PROTECTION

.1 Protect from damage through the duration of construction activities.

3.6 DEMONSTRATION | TRAINING

.1 Refer to Division 01 "Demonstration and Training".

.2 Manufacturer's Distribution Partner will be responsible to provide general product training to the Owner or their outsourced operations team at time of installation as well as conduct a comprehensive training session(s) to convey the methodology, and assembly of the modular partitions to sustain general operational maintenance by the Owner's personnel with clearance over the facilities lifetime.

.1 Reconfiguration and modifications shall comply with manufacturer's warranty requirements. Extensive or unusual changes will require additional Shop Drawings and manufactured components.

END OF SECTION

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for portable fire extinguishers.

1.2 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.
c. Larsens Manufacturing Company.

1) Basis of Design: Model #C24095R by Larsens, Rated and Fire Rating Flame Shield (FS). Refer to drawings for locations and fire ratings.
2) Size: 9 1/2" width x 24"tall x 3 1/2" deep

B. Cabinet Construction: Nonrated andTwo-hour fire rated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Red.
4) Orientation: Vertical.

K. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Color: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for fire-protection cabinets as required by type and size of cabinet and trim style.

B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction**.**

C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated.

E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

1.2 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.3 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ansul; brand of Johnson Controls International plc, Building Solutions North America.
b. Guardian Fire Equipment, Inc.
c. Larsens Manufacturing Company.
d. Substitutions: See Section 016000 - Product Requirements .

B. Multipurpose Dry-Chemical Type model #MP10: <>: UL-rated 4A: 80B:C <> nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

1. Capacity to combat Class A, Class B, and Class C fires.

C. Fire Cabinet: See section 104413 (Refer to drawings for quantities and location).

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

1. Mounting Height: Top of fire extinguisher handle to be at 48 inches above finished floor (Must meet ADA requirements).

END OF SECTION

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Manufacturers: Souce Limitations: Obtain roller shades from single source from single manufactuerer. Subject to compliance with requirements, provide products by the following:

1. MechoShade Systems, Inc.
2. Substitutions: Refer to Section 016000 - "Product Requirements" and Section 012500 "Substitution Procedures"

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Chain-Retainer Type: Clip, jamb mount .
2. Spring Lift-Assist Mechanisms: provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

D. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Enclosed in sealed pocket of shadeband material.

2.2 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Woven polyester and PVC-coated polyester.
3. Weave: Basketweave.
4. Thickness: .254mm .
5. Openness Factor: 5 percent.
6. Color: As selected by Architect from manufacturer's full range.

2.3 ROLLER SHADE COMPONENTS AND REQUIREMENTS

A. Access and Material Requirements

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

B. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capability which enables the drive chain to always fall in front of the fabric plane.

2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.

3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.

5. Provide shade hardware system that allows multi-banded, manually-operatedshades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.

6. Provide positive mechanical engagement of the drive mechanism to the shade roller tube. Friction-fit connectors for the drive mechanism connection to the shade roller tube are not acceptable.

7. Provide shade hardware constructed of minimum 16 gage, .060 inch (1.52 mm) thick plate steel or heavier as required to support 150 percent of the full weight of each shade.

C. Drive Bracket/Bracket Assembly:

1. Bracket model shall be fully integrated with all accessories including, but not limited to: fascia, room darkening side/sill channels, center supports and connectors for multi-banded shades.

2. Bracket and brake assembly shall rotate and be supported on a welded 5/16 inch (8 mm) steel pin.

3. The brake shall be an over-running wrapped spring clutch design which disengages during the raising and lowering of a shade. The brake shall withstand a minimum pull force of 50 lbs (22 kg) in the stopped position.

4. The braking mechanism shall employ an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes a wrapped spring clutch assembly that ensures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated requiring no maintenance. Products that require externally applied lubrication and/or are not permanently lubricated are not acceptable.

5. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

D. Drive Chain: No. 10 qualified stainless steel chain rated to 100 lbs (45kg) minimum breaking strength. Nickel plate chain shall not be acceptable.

2.4 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.

2. Fascia shall be able to be installed across two or more shade bands in one piece.

3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.

4. Provide bracket/fascia end caps where mounting conditions expose outside of roller shade brackets.

5. Fascia shall include a channel for application of flexible material to closing off any light leakage between the fascia and a window frame, mullion, ceiling and/or any other horizontal surface

6. Fascia shall attach directly to the roller shade bracket without the need to install additional mounting hardware. Exposed fasteners shall not be allowed.

7. Fascia shall positively lock in a top-down installation method to help prevent accidental damage

PART 3 - EXECUTION

3.1 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Supervise the roller shade installation, and settting of intermeciate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed plus or minus 0.25 inches (6mm).

2. Be responsible for field inspection on an area-by-area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.

3. Provide accurate field measurements to 1/16 inch (1.6 mm) for custom shade fabrication on the roller shades manufacturer's input forms.
4. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

D. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Basis of Design Manufacturer: Formica 742 Blanco Terrazzo - Everform; www.formica.com .

B. Solid Wood Edges and Trim: Clear red oak lumber, free of defects, selected for compatible grain and color, and kiln dried to 7 percent moisture content.

2.2 FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

1. Front: Straight, slightly eased at top Straight, slightly eased at top with separate apron, 6 inches high, recessed 1/4-inch behind front edge.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops

1.
2. 1" Thick, solid surface material with 1 1/2" radius bull nose edge, projecting 1 7/8" from wall overhang. Standard tops are 4" deep.

D. Joints:

1. Fabricate countertops without joints (if possible).

E. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures[in shop] using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.

D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

F. Install aprons to backing and countertops with adhesive.

G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

SECTION 22 00 00 -
PLUMBING BASICS

PART 1 GENERAL

1.01. SCOPE:

A. Install all fixtures as shown on the plans. Field verify exact locations.

B. Provide all equipment and specialties shown on the plans or specified herein.

C. Provide all necessary support, trim and accessories required.

D. All fixtures indicated to be ADA compliant shall be installed in full compliance with ADA guidelines.

1.02. Fixtures shall be equal to those scheduled on the Drawings.

1.03. All items furnished under this section shall be submitted for approval prior to ordering.

1.04. Fixtures shall meet all applicable code requirements and all authorities having jurisdiction.

PART 2 PRODUCTS

2.01. GENERAL:

A. Fixtures shall be non-absorbent throughout and free from waves, kiln marks or discoloration.

B. All surfaces coming in contact with walls, floors or other flat surfaces shall be flat.

C. All enameled iron ware shall be acid-resisting.

2.02. TRIM:

A. All exposed finished metal parts shall be chromium-plated; except, rough-bodied parts shall be nickel-plated.

B. All supplies shall be IPS brass; except, where otherwise specified.

C. All fixtures will be provided with supply stop.

D. Traps for lavatories and sinks shall be chrome-plated cast brass P-traps with clean-out.

E. Provide cast brass, chrome-plated, set screw type, escutcheons on supply and waste piping.

F. All trim for ADA fixtures shall be ADA-compliant.

2.03. CLEAN OUTS:

A. Caulking plugs: Cast iron cleanouts for caulking into soil pipe hub with straight threaded, plated raised hex head plug having tapered shoulder that seats against seal.

B. Wall cleanouts for dry wall or block construction shall be cast iron caulking ferrule for soil pipe hub, plated cast iron raised head plug with seal, tapped for machine screw, and stainless steel round access cover plate secured to plug by counter-sunk brass screw.

C. Wall cleanouts for plaster for tile wall construction shall be cast iron caulking ferrule for soil pipe hub, plated cast iron raised head plug with seal, tapped for machine screw, and cast Nickel alloy round flush access cover with polished top, anchor lugs, and cover plate secured to plug by counter-sunk brass screw.

D. Floor cleanouts shall be adjustable cast iron floor cleanout, coated cast iron internal cleanout plug with seal, polished nickel alloy rim and round scoriated cover plate, secured to plug by counter-sunk screw. Provide recessed top where cleanout occurs in tile floor. Provide cleanout marker when cleanout occurs in carpet.

E. Cleanouts to grade shall be cast iron cleanout, plated cast iron counter-sunk plug with seal, adjustable head and heavy-duty loose set round scoriated tractor cover.

2.04. WATER HEATERS:

A. Provide tank water heaters with ASTM rated T&P valve. T&P valve shall discharge per authority having jurisdiction, full size to outside the building or to an indirect waste receptor by means of an air gap.

B. Provide tank water heater with drain pan per authority having jurisdiction.

C. Provide tank water heater with Thermal Expansion tank per authority having jurisdiction.

PART 3 EXECUTION

3.01. All fixtures subject to damage prior to completion of building shall be protected in an approved manner. Job must be turned over to Owner with all fixtures clean and free from damage.

3.02. All wall-hung water closets and urinals shall be supported on chair carriers.

3.03. Unless specified to be furnished with chair carrier, wall-hung lavatories, sinks, and other fixtures. shall be secured to wall with back-up plate and threaded rods. Contractor shall provide all backing, reinforcing, hangers, bolts, anchors and brackets required.

3.04. Fixtures mounted and on uneven surfaces shall be bedded in an approved manner as per fixture manufacturer, owner, and engineer.

3.05. All hot and cold water supplies to plumbing fixtures or to shower heads shall have a drop-ear fitting secured to prevent movement.

3.06. AMERICANS WITH DISABILITIES ACT

A. All plumbing facilities shall be installed in compliance with the requirements of the Americans with Disabilities Act. Requirements include the following:

1. Water closet flush controls shall be mounted on the wide side of the toilet area.

2. Tub controls shall be mounted on the end wall on the entry side of the tub centerline.

3. Shower controls on stalls up to 36” wide shall be mounted on the side wall opposite the seat on the entry side of the shower centerline, and on stalls up to 60” wide shall be mounted on the back wall on the right side of the centerline.

4. Hot water piping and traps on fixtures supplied with hot water shall be insulated.

5. All controls and operating mechanisms shall be operable with one hand and without tight grasping, pinching, or twisting of the wrist.

B. Fixture and controls mounting heights, clear knee space, access clearances, etc. shall comply with ADA required dimensions, and as on details or schedules when shown.

3.07. Do not route piping through electrical or electronic enclosures, or above electrical gear located in other areas unless unavoidable. Install drip pan under piping which must be run through electrical spaces. Installation to be per National Electrical Code and as approved by local authority.

END OF SECTION

SECTION 22 0015
FIRESTOPPING AND SMOKE STOPPING

PART 1 - GENERAL

1.01. SUMMARY

A. Section includes:

1. Through-penetration firestopping in fire rated construction.

B. Scope:

1. The scope of the work shall include the mechanical systems, HVAC piping and ductwork, plumbing piping, fire protection piping, and other systems installed by the contractor.

1.02. 1.02 REFERENCES

A. Underwriters Laboratories

1. U.L. Fire Resistant Directory

a. Through-penetration firestop devices (XHCR)

b. Fire resistance ratings (BXUV)

c. Through-penetration firestop systems (XHEZ)

d. Fill, void, or cavity material (XHHW)

B. American Society for Testing and Materials Standards:

1. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.03. 1.03 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, time rated ceiling/floor assemblies, and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extending through thickness off barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.04. SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.05. SUBMITTALS

A. Submit in accordance with general conditions unless otherwise indicated.

B. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication

2. Manufacturer's installation instructions.

C. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.

2. Manufacturer or manufacturers’ representative shall provide qualified engineering judgements and drawings relating to non-standard applications as needed.

D. Quality control submittals:

1. Statement of qualifications.

E. Applicators' qualifications statement:

1. List past projects indicating required experience.

1.06. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07. REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.08. ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

D. Furnish forced air ventilation during installation if required by manufacturer.

E. Keep flammable materials away from sparks or flame.

F. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

G. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.09. SEQUENCING

A. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1.10. QUALITY ASSURANCE

A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.11. DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instruction.

1.12. PROJECT CONDITIONS

A. Existing conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

1.13. GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 PRODUCTS

2.01. THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Fire Resistance Director under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved and as further defined in Part 3.06 of this section.

3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

4. Products shall be 3M firestopping products and systems or equal.

2.02. SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-Penetration Smoke-Stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

B. Construction-Gap Smoke-Stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.03. MATERIALS

A. Firestopping Material: Single or multiple component silicone elastomeric rubber type foam compound mixed with incombustible non-asbestos ceramic fibers.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

2.04. 2.04 ACCESSORIES

A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

B. Forming materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02. SURFACE PREPARATION

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.03. INSTALLATION

A. Apply primer and materials in accordance with manufacturer’s instructions.

B. Install penetration seal materials in accordance with printed instruction of the U.L. Fire Resistance Directory and in accordance with manufacturer's instruction.

C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

D. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Apply firestopping material in sufficient thickness to achieve rating and to a uniform density and texture.

F. Protect materials from damage on surfaces subject to traffic.

G. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

H. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges - installed in accordance with fire damper manufacturer's recommendations.

I. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory.

J. Install smoke stopping as specified for firestopping.

K. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.

L. Dam material to remain.

3.04. FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.05. ADJUSTING AND CLEANING

A. Clean adjacent surfaces of firestopping materials.

B. Clean up spills of liquid components.

C. Neatly cut and trim materials as required.

D. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.06. PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.07. SYSTEMS AND APPLICATION

A. The installation shall be as required by manufacturer for type of construction, Type of U.L. systems, type of penetration, and type of fire stopping system.

END OF SECTION

SECTION 220030

ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the basic requirements for electrical components which are to be provided for operation of mechanical equipment. These components include, but are not limited to, motors, starters, and disconnect switches when indicated, furnished as an integral part of packaged mechanical equipment, or furnished separately for mechanical equipment.

B. Furnish all motor controllers and contactors, not furnished as part of a motor control center, for proper operation of all motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections and scheduled on the drawings.

1.02 REFERENCES:

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. National Electric Code (NFPA 70).

1.03 SUBMITTALS:

A. Separate submittal is not required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.04 QUALITY ASSURANCE:

A. Electrical components and materials shall be UL labeled.

B. The electrical work shall comply with the National Electric Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Equipment shall be by same manufacturer, except those items furnished by an equipment manufacturer as an integral part of his equipment. Where possible the equipment shall be by the same manufacturer specified by electrical.

2.02 MOTORS: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are included in the individual equipment specifications.

A. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

B. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. 2-speed motors shall have 2 separate windings on poly-phase motors.

D. Temperature Rating: Rated for 40 degrees C (104 degree F). environment with maximum 90 degree C (194 degree F) rise for continuous duty at full load (Class B insulation).

E. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly spaced starts per hour for manually controlled motors.

F. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

G. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

1. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.

2. Bearings:

a. Ball or roller bearings with inner and outer shaft seals.

b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.

c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

3. Enclosure Type:

a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.

b. Guarded drip-proof motors where exposed to contact by employees or building occupants.

c. Weather protected Type I for outdoor use, Type II where not housed.

4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

5. Noise Rating: "Quiet".

6. Efficiency:

a. Motor shall comply with the efficiency requirements of the Energy Independence and Security Act of 2007.

b. Motors smaller than 1 HP shall have minimum full load efficiencies levels per NEMA Standards.

c. Motors 1 HP and larger shall be premium efficiency.

7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.03 STARTERS, ELECTRICAL DEVICES, AND WIRING:

A. Motor Starter Characteristics:

1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R or NEMA 12 with conduit hubs installed by contractor, or units in hazardous locations which shall have NEC proper class and division.

2. Type and size of starter shall conform to adopted standards and recommended practices of the National Electric Code and Underwriters' Laboratories.

B. Manual Switches: Manual switches shall have:

1. Pilot lights and extra positions for multi-speed motors.

2. Overload protection: Melting alloy type thermal overload relays.

3. Manual starters / switches are to be used on fractional horsepower motors only.

C. Magnetic Starters:

1. Momentary contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

2. Trip-free thermal overload relays, each phase.

3. Interlocks, witches and similar devices as required for coordination with control requirements of controls sections.

4. Built-in 120 volt control circuit transformer, with 2 primary and one secondary fuse, where service exceeds 240 volts. Fuses sized to carry holding coil circuit and other connected devices.

5. Externally operated manual reset.

6. Under-voltage release or protection (3-wire control).

7. Branch circuit protection shall meet type 2 coordination protection.

8. A hand-off-auto selector switch shall be provided in addition to start-stop buttons for all devices being controlled automatically.

9. Phase loss relay.

a. Provide protective relays with DPDT 600V rated contacts, locking potentiometer undervoltage adjustment, and LED indicating light at each starter for motors greater than 5 HP. Equal to Square D Class 8430, Type MPD, mounted in suitable enclosure.

D. Motor Connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Heater Contactors:

1. Contactors for resistance heat shall be by same manufacturer as starters unless furnished with heaters. Contactors shall be of the magnetic type and mounted in NEMA Type 1 general purpose enclosure. Contactors shall carry a UL listing and shall be rated for 100,000 cycles.

F. Disconnect Switches:

1. Fusible Switches: Fused, each phase; heavy duty; horsepower rated; non-teasible, quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "open" position; arc quenchers; capacity and characteristics as indicated.

2. Non-fusible Switches: For equipment less than 1 horsepower, switches shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment 1 horsepower and larger, switches shall be the same as fusible type.

2.04 CAPACITORS:

A. Features:

1. Individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnant, craft tissue insulation, and aluminum foil electrodes.

2. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower and larger that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

3.01 GENERAL

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 hp and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Deliver starters and wiring devices which have not been factory-installed on equipment unit to electrical installer for installation.

C. Install starters and wiring devices at locations indicated, securely supported and anchored, and in accordance with manufacturer's installation instructions. Locate for proper operation access, including visibility, and for safety. Do not cover equipment data or informational tags when device is to be mounted on equipment.

D. Install control connections for motors to comply with NEC and applicable provisions of Electrical. Install equipment grounding except where non-grounded isolation of motor is indicated.

E. Connect protective relays to line side lugs of the motor starter and wire control contacts into motor starter circuit.

F. Label starters with engraved plastic nameplate describing the equipment served, e.g., "A.C. Unit No. 1". Nameplates shall be U.V. stabilized for use indoor / outdoor. Attach nameplates with clear silicone sealant.

END OF SECTION

SECTION 22 00 75

PLUMBING IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following mechanical identification applications:

1. Equipment identification.
2. Pipe identification.
3. Valve tags.
4. Valve schedule.

1.2 SUBMITTALS

A. Product Data: For each type of product proposed.

B. Product Schedule: Provide schedule indicating each type of identification material to be used for equipment, piping, and ductwork. Indicate colors to be used.

C. Valve Schedule: Submit a valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Provide three (3) copies. Mark valves which are intended for emergency shut-off, normally open, normally closed, and similar special uses by special flag in the margin of the schedule. Include the following for each valve:

1. Valve identification number
2. System
3. Purpose
4. Location
5. Type
6. Size
7. Manufacturer

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems", for letter size, length of color field, for colors not included in the schedule herein, and for viewing angles of identification devices for piping.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

A. Engraved Plastic Laminate Identification Signs

1. General: Provide engraving stock melamine plastic laminate in the sizes and thicknesses indicated, with engraver's standard letter style, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where using adhesive mounting.

2. Thickness: 1/16 inch for units up to 20 inches square or 8 inch length; 1/8 inch for larger units.

3. Fasteners: Self tapping stainless steel screws except use contact-type, permanent adhesive where screws cannot or should not penetrate the substrate. Where sign cannot be attached directly to device or equipment, attach with brass chain.

4. Letter sizes: Minimum ¼ inch for names of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of the principal lettering.

2.2 PIPE IDENTIFICATION

A. Subject to compliance with requirements, provide pipe markers by one of the following:

1. Seton
2. Brady
3. Brimar
4. EMED

B. All above grade piping shall be identified with pipe markers with colors as indicated. Identification shall have proper legend and meet OSHA specifications. Comply with ASME A13.1, unless otherwise noted.

C. For piping where diameter including insulation is less than 8 inch, pipe markers shall be plastic, pre-tensioned, semi-rigid type that encircles entire pipe without the use of adhesives. Tape and sticker types are unacceptable.

D. For piping where diameter including insulation is 8 inch or greater, pipe markers shall be plastic, full-band, semi-rigid type strapped to pipe using manufacturer's standard stainless steel bands.

E. Underground line markers: Manufacturer's standard permanent, bright colored, continuous printed, plastic tape intended for direct burial service, not less than 6" wide and 4 mils thick. Provide tape with printing which most accurately indicates the type of buried pipe.

F. Identification Schedule:

Piping System	Legend	Band/Text Color
1. Plumbing Piping System		
Cold Water	Cold Water	Green/White
Hot Water	Hot Water	Green/White
Hot Water Return	Hot Water Return	Green/White
2. Sanitary Sewer System		
Sanitary Waste	Sanitary Sewer	Green/White
Sanitary Vent	Sanitary Vent	Green/White

G. Arrows and lettering shall be black. Arrows shall point in the direction of flow. Locate downstream of pipe legend.

H. Arrows shall be of same color as bands and shall point in direction of flow. Locate downstream of pipe legend.

I. Valve Identification: Provide brass tags for all valves and steam traps with legend describing function of each valve and trap. Tag shall also indicate normally open or normally closed, where position is noted on the drawings.

J. Valve Tags: Brass tags shall be a minimum of 2" diameter or 3-1/2" oval, to accommodate 1" high numbers. Tag shall be equipped with a 3/16" X 6" long brass chain.

2.3 STENCILS

A. Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4" for ducts; and minimum letter height of ¾" for equipment and access door signs. Use alkyd paint. Use stencils only as directed herein.

PART 3 EXECUTION

3.1 EQUIPMENT IDENTIFICATION

A. Provide permanent, factory, operational data, nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location. Where manufacturer's nameplate is not stamped or engraved, provide additional heavy gauge, aluminum or brass, stamped or engraved nameplate. Do not remove manufacturer's nameplates. When manufacturer's nameplates are to be covered by insulation or other material, provide a separate nameplate for mounting on the exterior of the covering.

B. In addition to factory nameplate, provide an engraved plastic laminate (stenciled) identification sign for each major item of mechanical equipment and each operational device. Provide identification signs for the following general categories of equipment.

1. Main control and operating valves, including safety devices and hazardous units such as gas

outlets.

2. Compressors, pumps, and similar motor-driven units.

3. Tanks and pressure vessels.

4. Strainers, filters, humidifiers, water treatment systems, and similar equipment.

5. Control panels.

6. Fuel burning units, such as boilers, furnaces, and heaters.

C. Provide engraved sign at each access door, indicating equipment or device to be accessed.

D. Coordinate names, abbreviations, and other designations used in equipment identification with corresponding designations shown, specified, scheduled, or as designated by the Owner's representative. Provide numbers, lettering, and wording as indicated or as directed by the Owner's representative. Owner shall set priority for lettering and graphics. Where multiple systems of the same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, AHU-1H, Standpipe G14).

E. Provide Ceiling Grid Labels for Equipment:

1. Letter Color: Black

2. Background Color: White

3. Minimum Label Size: Length may vary for required label content, but dimensions shall not be less than 2-1/2 by 3/4 inch.

4. Minimum Letter Size: 1/2 inch.

5. Self adhesive, compatible with label and with substrate.

6. Locate on ceiling grid or access door nearest access side of equipment.

3.2 PIPE IDENTIFICATION

A. Provide 1" thick molded fiberglass insulation with jacket under each plastic pipe marker to be installed on uninsulated pipes where fluid temperatures will be 125°F or greater. Insulation shall extend 4" beyond edges of marker.

B. Valve tags and steam traps shall be numbered as indicated on the valve listing provided to the Owner.

C. As a minimum, identification shall be applied to piping at the following locations:

1. Adjacent to each valve.

2. At each branch and riser take-off.

3. At each pipe passage through wall, floor, and ceiling construction.

4. At each pipe passage to underground.

5. At not more than forty feet spacing on straight pipe runs.

D. Place identification so it can be easily read. Arrows shall be applied to indicate direction of flow.

E. Underground Piping: During back-filling of each exterior underground piping system, install plastic line marker, located directly over buried line no deeper than 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install a single line marker.

END OF SECTION

SECTION 22 0086

PIPING INSULATION

PART 1 - GENERAL

1.01. SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets, and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Insulation of Underground Piping is specified elsewhere and not work of this Section.

1.02. REFERENCE STANDARDS

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 B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.

4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

9. ASTM C547 - Mineral Fiber Pipe Insulation.

10. ASTM C552 - Cellular Glass Thermal Insulation.

11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

14. ASTM C450 - Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

15. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.

16. ASTM C921 - Jackets for Thermal Insulation.

17. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

18. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

19. ASTM D1667 - Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed- Cell).

20. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

21. ASTM C795 - Insulation For Use Over Austenitic Steel.

22. ASTM E84 - Surface Burning Characteristics of Building Materials.

23. ASTM E96 - Water Vapor Transmission of Materials.

24. NFPA 255 - Surface Burning Characteristics of Building Materials.

25. UL 723 - Surface Burning Characteristics of Building Materials.

26. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.03. DEFINITIONS

A. Concealed: Areas that cannot be seen by the building occupants.

B. Interior Exposed: Areas that are exposed to view by the building occupants, including underneath countertops, inside cabinets and closets, and all equipment rooms.

C. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.

D. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

E. Unconditioned Space: Interior space that is not temperature-controlled by cooling and/or heating system. Includes attics, chases, unconditioned living spaces and non-conditioned equipment rooms.

1.04. QUALITY ASSURANCE

A. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, and accessories utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.

1. Certificates to this effect shall be submitted along with submittal data.

2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

F. Stainless Steel: Insulation applied on stainless steel shall meet requirements of ASTM C795 and NRC 1.36. These requirements are for prevention of external stress Corrosion Cracking (ESCC) for austenitic stainless steel.

1.05. SUBMITTALS

A. Prepare a schedule of piping insulation showing systems insulated. For each system, show insulation type, thickness, temperature rating, and special conditions where applicable.

B. Submit product data for each piping system. Product data shall include but not be limited to the following:

1. Manufacturer's name

2. Insulation material and thickness

3. Jacket

4. Adhesives

5. Fastening methods

6. Fitting materials

7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)

9. Other appropriate data

C. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.

D. Operation and Maintenance Data: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.06. DELIVERY, STORAGE and HANDLING

A. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer’s identification including product thermal ratings and thickness.

B. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

C. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01. 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.

2.02. MANUFACTURERS

A. Insulation:

1. Owens-Corning

2. Certainteed Corporation

3. Johns Manville Corporation

4. Knauf Corporation

5. Armstrong/Armacell (Armaflex)

6. RBX Industries/Rubatex

7. FOAMGLAS (Cellular Glass) by Pittsburgh Corning

B. Jackets:

1. Childers Products Company

2. PABCO

3. RPR Products, Inc.

4. John Mansfield Speedline

5. Foamglas

C. Coatings, Sealants, and Adhesives:

1. Foster

2. Childers

2.03. INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Piping Insulation Type P1: Glass-Fiber, Preformed Pipe Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A with factory applied ASJ-SSL vapor barrier jacket with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I. Provide one of the following:

1. Owens Corning; Evolution Fiberglas Pipe Insulation.

2. Johns Manville; Micro-Lok Pipe Insulation.

3. Knauf; Earthwool 1000 degree Pipe Insulation.

F. Piping Insulation Type P2: Flexible Elastomeric Pipe Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Provide one of the following:

1. Armacell LLC; AP Armaflex

2. Aeroflex USA Inc; Aerocel

3. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Piping Insulation Type P3: Handicap Lavatory and Sink Piping Insulation Kit:

1. Handicap lavatory and sink drain piping, P-trap, cold and hot water assemblies and valves shall be insulated with fully molded insulation kit specifically designed for handicap lavatories and sinks. ADA conforming.

2. Material shall be 3/16" thick molded closed cell vinyl with nylon fasteners, white finish and be self-extinguishing per ASTM D635, with K value of 1.17 BTU/in./hr./sq. ft./deg. F.

H. Piping Insulation Type P4: Preformed Cellular Glass: Comply with ASTM C 585, ASTM C 450. Provide one of the following:

1. Pittsburgh Corning; Foamglas

2.04. FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe. Provide one of the following:

1. Foster Brand, Specialty Construction Brands, Inc; Mast-A-Fab.

2. Vimasco Corporation; Elastafab 894.

2.05. FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Piping Jacket Type J1: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; 40 mil thickness, roll stock ready for shop or field cutting and forming. Provide factory-fabricated fitting covers to match jacket. Provide one of the following

1. Johns Manville; Zeston.

2. Proto Corporation; LoSmoke

C. Piping Jacket Type J2: Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14. Provide factory-fabricated fitting covers or field fabricate covers only if factory-fabricated fitting covers are not available. Provide one of the following:

1. Provide Childers Brand Metal Jacketing Systems.

2. Provide shop fabricated smooth aluminum jacket 0.016".

2.06. TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.

2. Thickness: 6 mils.

3. Adhesion: 64 ounces force/inch in width.

4. Elongation: 500 percent.

5. Tensile Strength: 18 lbf/inch in width.

2.07. INSULATION INSERTS

A. Provide insert between support shield and piping on piping 1 1/2" diameter or larger. Inserts shall be factory fabricated of heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1. 1 1/2" to 2 1/2" pipe size 10" long

2. 3" to 6" pipe size 12" long

3. 8" to 10" pipe size 16" long

4. 12" and over 22" long

2.08. PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12-inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

E. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

F. Adhesives: Compatible with insulation.

G. Banding:

1. Aluminum bands, 3/4" x 0.02 inches

2. Stainless Steel, 304, 3/4" by 0.02 inches

PART 3 - EXECUTION

3.01. PREPARATION

A. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping shall be completely dry at the time of application. Insulating piping where condensate is occurring is unacceptable. Wet insulation is unacceptable and shall be removed and replaced before acceptance by the Owner.

B. Coordinate insulation installation with trade installing heat trace. Comply with requirements for heat tracing that apply to insulation.

C. Verify that piping has been tested for leakage before applying insulation.

3.02. GENERAL INSTALLATION REQUIREMENTS

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards, and shall conform to codes and ordinances of authorities having jurisdiction.

B. Installation of insulation and jacket materials shall be in accordance with manufacturer's published instructions.

C. Handle and install materials in accordance with manufacturer's instructions in the absence of specific instructions herein.

D. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.

E. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

F. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

G. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

H. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

I. Install insulation with longitudinal seams at top and bottom of horizontal runs.

J. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

K. Keep insulation materials dry during application and finishing.

L. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

M. Install insulation with least number of joints practical.

N. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

O. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

P. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

Q. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

R. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

S. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere and seal patches similar to butt joints.

T. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.03. PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Comply with requirements in Section 15050 for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 15050."

3.04. GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket where concealed unions, check valve or piping specialties are insulated. Provide descriptive label at device under the insulation. For example at each union stencil with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05. INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.06. INSTALLATION OF GLASS-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on below-ambient surfaces, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.07. FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.08. FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Do not field paint aluminum jackets.

3.09. PIPING SYSTEMS INSULATION SCHEDULE

PIPING SYSTEMS INSULATION SCHEDULE					
SERVICE	INSULATION TYPE	LOCATION	JACKET TYPE	PIPE SIZE	INSULATION THICKNESS BY PIPE SIZE
COLD PIPING					
DOMESTIC COLD WATER	P1	INTERIOR CONCEALED	--	0.75" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		EXTERIOR	J2	0.75" AND SMALLER	1.0"
				1.0" THROUGH 2.0"	1.5"
				2.5" AND LARGER	2.0"
		EQUIPMENT ROOMS	J1	0.75" AND SMALLER	0.5"
		BELOW 7.0" ABOVE FLOOR		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		BELOW 7.0" ABOVE FLOOR		4.0" AND LARGER	0.75"
HOT PIPING					
DOMESTIC HOT WATER	P1	INTERIOR CONCEALED	--	0.75" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		INTERIOR EXPOSED		0.75" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		UNCONDITIONED	--	0.75" AND SMALLER	0.5"

		SPACE		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		EXTERIOR		0.75" AND SMALLER	1.0"
				1.0" THROUGH 2.0"	1.5"
				2.5" AND LARGER	2.0"
		EQUIPMENT ROOMS	J1	0.75" AND SMALLER	0.5"
		BELOW 7.0" ABOVE FLOOR		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
DOMESTIC HOT WATER AND DRAIN AT HANDICAP LAVATORIES	P3				

END OF SECTION 22 0086

SECTION 22 0090

SUPPORTS, HANGERS AND ANCHORS

PART 1 GENERAL

1.01. WORK INCLUDED

A. Inserts, Anchors, and Upper Attachments

B. Pipe Hangers, Rods, Supports, and Accessories

C. Fabricated Steel Support

1.02. QUALITY ASSURANCE

A. Design of pipe supporting elements shall be in accordance with ANSI B31.1

B. Fabrication and installation of pipe hangers and supports shall be in accordance with the following Manufacturers Standardization Society (MSS) Standards:

1. SP-58 Pipe Hangers and Supports: Materials, Design and Manufacture.

2. SP-69 Pipe Hangers and Supports: Selection and Application.

3. SP-89 Pipe Hangers and Supports: Fabrication and Installation Practices.

C. Steel angles, channels and plate shall be in accordance with ASTM A36, red primed or hot dipped galvanized for interior applications and hot galvanized for exterior applications.

D. Bolts, including nuts and washers, used for fabricating steel members shall be in accordance with ASTM A325 and shall be stainless steel or plated for corrosion protection. Plain steel components are unacceptable.

E. Welding of steel members shall be in accordance with AWS D1.1.

F. Steel supports for ducts, pipe anchors, pipe guides, and piping supported from below shall be fabricated in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for buildings. If required, the Contractor shall include the cost of the services of a structural engineer to design or review the system.

1.03. APPLICABLE PUBLICATIONS

A. Applicable sections of the publications listed below form a part of this Section. The publications are referenced by the basic designation only.

1. American Institute of Steel Construction (AISC)

2. American National Standards Institute (ANSI)

3. American Society for Testing and Materials (ASTM)

4. American Welding Society (AWS)

5. The Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)

6. National Fire Protection Agency (NFPA)

7. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

1.04. SUBMITTALS

A. Submit schedule indicating type of hanger to be used by system and pipe size. Include rod size for each hanger size.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Provide shop drawings for fabricated steel supports.

PART 2 PRODUCTS

2.01. ACCEPTABLE MANUFACTURERS

A. Inserts, Anchors, and Upper Attachments:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elecen Metal Products

5. Hilti

6. Unistrut

7. ITW Red Head

B. Pipe Hangers, Rods, Supports and Accessories:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elcen Metal Products

5. Hilti

6. Unistrut

C. Fabricated Steel Support: As indicated on Drawings.

2.02. DESIGN REQUIREMENTS

A. Supports capable of supporting the pipe for all service and testing conditions. Provide 4-to-1 safety factor.

B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.

C. Design supports and hangers to allow for proper pitch of pipes.

D. For chemical and waste piping, design, materials of construction, and installation of pipe hangers, supports, guides, restraints, and anchors:

1. ASME B31.3.

2. MSS SP-58 and MSS SP-69.

3. Except where modified by this Specification.

E. For steam and hot and cold water piping, design, materials of construction and installation pipe hangers, supports, guides, restraints and anchors:

1. ASME B31.1

2. MSS SP-58 and MSS SP-69.

F. Check all physical clearances between piping, support system, and structure. Provide for vertical adjustment after erection.

G. Support vertical pipe runs in pipe chases at base of riser. Support pipes for lateral movement with clamps or brackets.

H. Place hangers on outside of pipe insulation. Use a pipe covering protection saddle for insulated pipe at support point.

I. Fabricated Steel Supports: As detailed on the drawings.

2.03. INSERTS AND ANCHORS

A. Inserts: MSS Type 18; malleable iron body and nut, galvanized finish, opening in top of insert for reinforcing rod, lateral adjustable.

B. Anchors: Steel shell and expander plug, snap off end fastener

2.04. HORIZONTAL PIPING HANGERS AND SUPPORTS

A. Select size of hangers and supports to exactly fit pipe size for bare piping, and around piping insulation with saddle or shield for insulated piping.

B. For suspension of non-insulated or insulated stationary pipe lines: Adjustable steel clevices, MSS Type I.

C. For suspension of non-insulated stationary pipe lines: Adjustable band hangers, MSS Type 7 or 9; or split pipe rings, MSS Type II.

D. For support of piping where horizontal movement due to expansion and contraction may occur, and where a low coefficient of friction is desired: Pipe slides and slide plates, MSS Type 35, including guided plate mounted on a concrete pedestal or structural steel support.

E. For support from floor stanchion, using floor flange to secure stanchion to floor: Adjustable pipe stanchion saddles, MSS Type 37 or 38, including steel pipe base support and cast-iron floor flange.

F. For suspension of pipe from two (2) rods where longitudinal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

G. For suspension of pipe from a single rod where horizontal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

H. For support of pipe from a single rod where vertical adjustment is not necessary: Pipe roll stands, MSS Type 45.

I. For support of pipe where small horizontal movement due to expansion and contraction may occur, but vertical adjustment is not necessary: Pipe rolls and plates, MSS Type 45.

J. For support of pipe lines where vertical and lateral adjustment during installation may be required in addition to provision for expansion and contraction: Adjustment pipe rolls stands, MSS Type 46.

2.05. VERTICAL PIPING CLAMPS

A. Select size of vertical piping clamps to exactly fit size of bare pipe.

B. For support and steadying of pipe risers: Two-bolt riser clamps, MSS Type 8 or 42.

2.06. HANGER ROD ATTACHMENTS

A. Select size of hanger rod attachments to suit hanger rods.

B. For adjustment up to six (6) inches for heavy loads: Steel turnbuckles, MSS Type 13.

C. For use on high temperature piping installations: Steel clevices, MSS Type 14.

D. For use with split pipe rings, MSS Type II: Swivel turnbuckles, MSS Type15.

E. For attaching hanger rod to various types of building attachments: Malleable iron sockets, MSS Type 16 or 17.

F. Rods:

1. Size 3/8" and up: All thread steel rod electro galvanized. Sizing for pipe or equipment support as follows:

Copper Tube, Plastic	Steel, Cast Iron		
Pipe Size (Copper, Plastic)	Pipe Size (Steel, Cast Iron)	Rod Size	Max. Equip. Load
1/4" to 2"	1/4" to 2"	3/8"	730 lbs.
2-1/2" to 4"	2-1/2" to 3"	1/2"	1,350 lbs.
6"	4"	5/8"	2,160 lbs.
8" to 12"	6"	3/4"	3,230 lbs.
14"	8" to 12"	7/8"	4,480 lbs.
16"	14" to 16"	1"	5,900 lbs.
18" to 20"	18" to 20"	1-1/4"	9,500 lbs.
22" to 42"	22" to 42"	1-1/2"	13,800 lbs.

2. Rods may be reduced one size for double rod hangers with 3/8" minimum diameter, or when other paragraphs require a minimum of 2 hangers per section, provided the minimum diameter of 3/8" is maintained.

G. For upper attachment for suspending pipe hangers from concrete: Concrete inserts MSS Type 18.

H. For attachment to top flange of structural shape: Top beam C-clamps, MSS Type 19.

I. For attachment to bottom flange of structural shape: Side beam or channel clamps, MSS Type 20 or 27.

J. For attachment to center of bottom flange of beams: Center beam clamps, MSS Type 21.

K. For attachment to bottom of beams where heavy loads are encountered and hanger rod sizes are large: Welded attachments, MSS Type 22.

L. For attachment to structural shapes: C-clamps, MSS Type 23.

M. For attachment to top of beams when hanger rod is required tangent to edge of flange: Top I-beams clamps, MSS Type 25.

N. For attachment to bottom of steel I-beams for heavy loads: Steel I-beam/WF-beam clamps with eye nut, MSS Type 28 or 29.

O. Steel brackets, for indicated loading:

1. Light duty, 750 pounds, MSS Type 31.

2. Medium duty, 1,500 pounds, MSS Type 32.

3. Heavy duty, 3,000 pounds, MSS Type 33.

P. For use on sides of steel beams: Side beam brackets, MSS Type 34.

2.07. SPRING HANGERS AND SUPPORTS

A. Select spring hangers and supports to suit pipe size and loading.

B. For control of piping movement: Restraint control devices, MSS Type 47.

C. For light loads where vertical movement does not exceed 1-1/4 inch: Springs cushion hangers, MSS Type 48.

D. For equipping Type 41 roll hanger with springs: Spring cushion roll hangers, MSS Type 49.

E. For retardation of sway or thermal expansion in piping systems: Spring way braces, MSS Type 50.

F. For absorbing expansion and contraction of piping system from hanger: Variable spring hangers, MSS Type 51; preset to indicated load and limit variability factor to 25%.

G. For absorbing expansion and contraction of piping system from base support: Variable spring base supports, MSS Type 52; preset to indicated load and limit variability factor to 25%; include flange.

H. For absorbing expansion and contraction of piping system from trapeze support: Variable spring trapeze hangers, MSS Type 53; preset to indicated load and limit variability factor to 25%.

I. Constant supports: Provide one of the following types, selected to suit piping system. Include auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.

1. Horizontal Type: MSS Type 54.

2. Vertical Type: MSS Type 55.

3. Trapeze Type: MSS Type 56.

2.08. SUPPLEMENTARY SUPPORTS

A. Where support spacing is more frequent than distance between structural members, provide steel angles, channels or beams sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer pipe support loads to structural members.

B. Where deflection of center of trapeze support exceeds 1/240 of distance between hanger rods, provide additional hanger rods.

C. Where multiple risers are supported within shafts, provide steel angles, channels or beams, sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer loads to the concrete floor slab. Anchor supplemental supports to the slab, and provide resilient element where required by other Sections of this Division.

2.09. ACCESSORIES

A. Protective Shields, MSS Type 40: Carbon steel, galvanized minimum of 12" length sized for required insulation.

B. Protective Saddles, MSS Type 39: Carbon steel plate, minimum of 12" length, sized for required insulation.

C. Steel Turnbuckle, MSS Type 13: Forged steel, galvanized finish with locknuts. Rated at a minimum of 730 lbs. at 3/8" size.

D. Steel Clevis, MSS Type 1: Forged steel, galvanized finish with steel pin and cotter pin. Rated for a minimum of 730 lbs. at 3/8" size.

E. Weldless Eye Nut, MSS Type 17: Forges steel, galvanized finish. Rated for a minimum of 730 lbs. at 3/8" size.

2.10. PIPE INSULATION HANGER SHIELDS

A. Where hangers are placed outside the jackets of pipe insulation, provide shields equal to "Thermal Hanger Shields" as manufactured by Pipe Shields, Inc. or equivalent by Elcen Metal Products Company.

B. Shields shall consist of a 360-degree insert of high-density, 100 psi, waterproof calcium silicate, encased in a 360-degree galvanized sheet steel shield. Insert shall be same thickness as adjoining pipe insulation, and shall extend 1 inch beyond sheet metal shield in each direction on cold lines. Shield lengths and minimum sheet metal gauges shall be as directed below:

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2" to 1-1/2"	4"	26
2" to 6"	6"	20
8" to 10"	9"	16
12" to 18"	12"	16
20" & Larger	18"	16

C. Shields shall be Model CS-CW, except for pipe roller applications: then provide Model CSX-CW.

D. At the Contractor's option, shop-fabricated galvanized metal shields may be provided based on approved shop drawings. Length and gauge of sheet metal shall be as specified above.

E. For all insulated piping 4” and larger, provide insulation insert at a minimum of 12” long. Insert shall extend a minimum of one inch beyond shield. Insulation inserts shall be minimum 12” long section of foam glass insulation.

2.11. METAL FRAMING: Provide products compliant with NEMA ML-1.

2.12. STEEL PLATES, SHAPES AND BARS: Provide products compliant with ANSI/ASTM A-36.

2.13. PIPE GUIDES: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base, with a two-section guiding spider bolted tight to pipe or as shown on Drawings. Size guides and spiders to clear pipe, cylinder and insulation, if any. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 EXECUTION

3.01. GENERAL REQUIREMENTS

A. Where applicable, install in accordance with the manufacturer's written installation instructions.

B. Where supports are in contact with copper pipe, provide copper plated support.

C. Where supports are in contact with glass, aluminum or brass pipe, provide plastic coating on supports.

D. Interior hangers, supports, including attachments, that are plain steel shall be primed and painted.

E. Hangers and supports, including attachments, exposed to weather or located in utility tunnels or

accessible utility trenches or subject to spillage shall be hot dip galvanized after fabrication.

F. Fabricated steel supports exposed to weather or located in utility tunnels and accessible utility trenches or subject to spillage shall be primed and painted. Cut, welded, drilled or otherwise damaged surfaces of coating shall be repaired.

3.02. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including but not limited to proper placement of inserts, anchors and other building structural attachments.

3.03. INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps and attachments to support piping properly from building structure in compliance with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together in trapeze-type hangers where possible. Install supports with maximum spacing as specified in this Section. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for small diameter pipe. Do no use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire protection water piping independently of other piping

D. The location of hangers and supports shall be coordinated with the structural work to ensure that the structural members will support the intended load.

E. Provide hex head nut on rod at top and bottom of clevis hanger yoke, and at each rod connection to intermediate und upper attachment. Rod nuts shall be securely locked in place.

F. Hanger rods shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing.

G. Hangers shall be fabricated to permit adequate adjustment after erection while still supporting the load. Turnbuckles shall be provided where required for vertical adjustment of the piping.

H. Supports for vertical piping shall be located at each floor or at intervals of not more than 15 feet and at intervals of not more than 8 feet from end of risers. Where supports are provided on intermediate floors spaced 15 feet or less between floors, no additional supports are required other than those specified for end of risers.

I. A hanger or support shall be provided adjacent to each piece of equipment to ensure that none of the pipe weight is supported from the equipment.

J. Provide protective shields on all piping required to be insulated.

K. Provide protective saddles sized to match insulation thickness on all hot piping required to be insulated. Fill void between saddle and pipe with insulation as specified.

L. Provide turnbuckles on all hangers that require leveling or aligning.

M. Provide steel clevis where detailed and/or required.

N. Provide weldless eye nuts on hanger terminations where disassembly or swing may be required. Use in combination with steel clevis.

O. Supports

1. Provide additional supports at:

a. Changes in direction.

b. Branch piping and runouts over 5 feet.

c. Concentrated loads due to valves, strainers and similar items.

d. At valves 4 inches and larger in horizontal piping.

e. Support piping on each side of valve.

f. Brace hubless piping to prevent horizontal and vertical movement.

g. Where number of grooved couplings exceeds 3 between supports or provide continuous steel between supports.

2. Sanitary waste and vent, roof drains per UPC Section 316: Vertical supports are not required within 2.5 feet of wall penetrations for pipes 8 inches in diameter and smaller, and not more than 3 feet for 10 inches and larger.

3. Other piping support spacing shall be as scheduled on Drawing or as required by referenced standard.

3.04. HANGER SPACING

A. The maximum spacing between pipe supports for straight runs shall be in accordance with the following chart. If any deviation from the table exists within the manufacturer's written installation instruction, whichever spacing reflecting the smaller centerline to centerline dimension shall be used.

MAXIMUM HORIZONTAL PIPE HANGER AND SUPPORT SPACING TABLE

1. Steel Pipe (Schedule 40 & 80):
Up to 1".....7 ft. on center
1-1/4" and greater.....10 ft. on center

2. Copper Pipe (Types L, K and M):
Up to 1" size:.....5 ft. on center
1-1/4" to 2-1/2" .....7 ft. on center
3" and larger.....10 ft. on center

3. Ductile Iron and Cast Iron: Two hangers per section length.

4. Polyvinyl Chloride (PVC):
Up to 1-1/2".....3 ft. on center
2" to 4" .....4 ft. on center
5" to 8" .....5 ft. on center
10" and larger.....6 ft. on center

5. Sprinkler and Standpipe: Pipe hangers to be as per NFPA-13 and NFPA-14 standards.

B. Hanger centerline spacing shall be reduced by 50% in areas of concentrated valves and/or fittings, also no more than a maximum distance of 12 inches from valves, fittings and/or couplings, or 24 inches from a change in direction.

3.05. ATTACHMENT TO STRUCTURE

A. For plain steel devices, prime and paint.

B. Adjust attachment location for proper alignment and no more than 4 degrees offset from a perpendicular alignment.

C. If proper alignment cannot be achieved from the existing building structure, provide a trapeze type support sized to handle the design load with a minimum safety factor of 5.

3.06. INSERTS

A. Contractor shall have inserts at site and dimensional location drawings ready at the beginning of the involved concrete work.

B. Install inserts by securing to concrete forms and inserting reinforcing rod through the opening provided in the insert in accordance with shop drawings.

C. Provide necessary supervision while concrete is being poured to correct any misalignment caused by the concrete.

3.07. INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B-31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bards to piping and to structure. Comply with ANSI B-31, with AWS standards, and with the Details shown on the drawings.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required, accommodating both expansion and contraction of piping.

E. Size anchor shell length to assure a minimum of 1" solid concrete remaining from shell and to concrete face.

3.08. INSTALLATION OF TRAPEZES OR PIPE RACKS

A. Light/Medium Duty: Assemble from standard manufactured metal framing systems, in accordance with manufacturer's recommendations.

B. Heavy Duty: Fabricate from structural steel shapes selected for loads required. Weld steel in accordance with AWS standards.

3.09. AUXILIARY STEEL

A. Furnish all miscellaneous structural members necessary to hang or support ductwork, piping, and mechanical equipment.

B. Notify Engineer of any adjustment necessary in main structural system for proper support of

major equipment.

C. Fabricated Steel Supports: Steel for supports shall be saw cut, with sharp edges ground smooth. After fabrication, remove all foreign material, including welding slag and spatter, and leave ready for painting.

END OF SECTION

SECTION 22 01 10

BASIC VALVES

PART 1 - GENERAL

1.01 Valves specified in this section are for general use. See specifications for specific systems and special valves.

1.02 SUBMITTALS

A. Product Data: Provide for each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories. Provide valve schedule with product data listing valves used for each service application.

1.03 QUALITY ASSURANCE:

A. Single Source Responsibility: Where possible valves shall be by the same manufacturer.

B. MSS Standard Practices: Comply with the MSS standards for valves specified.

C. ASME: Comply with ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.

D. NSF: Comply with NSF 61 for valve materials for potable water service.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Preparation for Transport:

1. Ensure valves are dry and internally protected against rusting and galvanic corrosion.

2. Protect valve ends against mechanical damage to threads, flange faces, and weld end preps.

3. Set valves in best position for handling. Globe and gate valves shall be closed to prevent rattling; plug valves shall be open to minimize exposure of functional surfaces; butterfly valves shall be shipped closed or slightly open; and swing check valves shall be blocked in either closed or open position.

B. Storage:

1. Do not remove valve end protectors unless necessary for inspection; reinstall for storage.

2. Protect valves against weather. Where practical store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is

necessary, support valves off the ground or pavement and protect in watertight enclosures.

C. Handling: Valves whose size requires handling by crane or lift shall be slung or rigged to avoid damage to exposed valve parts. Handwheels and stems, in particular, shall not be used as lifting or rigging points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering valves which may be incorporated in the work include the following. For majority of valves, Milwaukee has been used as basis of design. Equal valves of other manufacturers may be submitted without substitution requests.

1. APCO
2. Apollo
3. CPV
4. Crane
5. DeZurick
6. Grinnell
7. Hammond
8. Jamesbury
9. Jenkins
10. Keflex
11. Metraflex
12. Milwaukee
13. Mueller
14. Nibco
15. Nordstrom
16. Powell
17. Stockham
18. Walworth
19. Watts

2.02 VALVE FEATURES:

A. Valve Design: Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: Not less than indicated and required to suit system pressures and temperatures.

C. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

D. Operators: Provide the following special operator features:

1. Handwheels, fastened to valve stem, for valves other than quarter turn.

2. Lever handle on quarter-turn valves 4 inch and smaller, except for plug valves. Provide one wrench for every 10 plug valves.

3. Chain-wheel operators for valves 2-1/2 inch and larger installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.

4. Gear drive operators on quarter-turn valves 6 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Provide bypass and drain connections required by manufacturer and as indicated on the drawings.

G. End Connections: As specified in the individual valve specifications.

1. Threads: Comply with ANSI B1.20.1.

2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

H. Valves for Domestic Hot Water and Cold Water.

1. Gate Valves:

a. 2 inch and Smaller: Class 125, body and bonnet of ASTM B62 cast bronze, threaded ends, solid disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires. Milwaukee #105.

b. 2-1/2 Inch and Larger: Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and packing gland assembly. Milwaukee #F-2885A.

2. Ball Valves:

a. Valves 2 Inches and Smaller: Threaded ends, rated for 400 psi WOG pressure; 3 piece construction, bronze body conforming to ASTM B 62, full port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide insulator type handle for chilled water and condensate drain. Milwaukee BA-300.

3. Plug Valves:

a. 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends. Lunkenheimer 454.

b. 2-1/2 Inch and Larger: 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends. Nordstrom 143.

4. Globe Valves:

a. 2 Inch and Smaller: Class 125, body and screwed bonnet of ASTM B 62 cast bronze, threaded ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires. Milwaukee #502T.

b. 2-1/2 Inch and Larger: Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; outside screw and yoke, bronze mounted, flanged ends, and packing gland assembly. Milwaukee F2981A.

5. Butterfly Valves: 2-1/2 Inch and Larger: 200 psi, cast iron body conforming to ASTM A 126, Class B. Valves shall have field replaceable EPDM sleeve, with nickel-plated ductile iron disc (except valves installed in condenser water piping which shall have aluminum bronze disc), stainless steel stem, and EPDM O-ring stem seals. Valves shall have gear operator with extended wheel handle and position indicator. Valves shall be lug type, drilled and tapped. Valves shall be suitable for dead end service, Class I, tight shut off. Milwaukee CL 223E.

6. Check Valves:

a. Swing Check Valves:

1. 2 Inch and Smaller: Class 125, cast bronze body and cap conforming to ASTM B 62, horizontal swing, Y-pattern, with a bronze disc, and having threaded ends. Valve shall be capable of being reground while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available. Milwaukee #509.

2. 2-1/2 Inch and Larger: Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Milwaukee #F2974A.

b. Spring Loaded (Non-Slam Check Valves for Pumps: Valves shall be iron body, globe typed silent check valves, bronze mounted, stainless steel spring with flanged (125-pounds drilling) end connections for installation between ASA 150 lbs. flat face steel slip on weld flanges. Valves shall be comparable to Mueller #105-AP, APCO Series 600, CPV Globe Type Silent Check Valve, Kelflex K-Check Silent Check Valve, or Metraflex Globe Style Silent Check Valve.

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Examine piping systems for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior, threads, and flanges for cleanliness, and signs of damage or corrosion. Remove all shipping materials.

C. Actuate valve through an open-close cycle to determine if operation is proper.

D. Examine the piping for cleanliness and alignment.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gaskets are of proper size, that material composition is suitable for service, and are free from defect.

F. Do not attempt to repair a defective valve. Replace all defective valves with new valves.

3.02 VALVE SELECTION:

A. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size 2 Inch and Smaller: Threaded ends.

2. Steel Pipe Sizes 2 Inch and Smaller: Threaded ends.

3. Steel Pipe Sizes 2-1/2 Inch and Larger: Flanged.

B. Ball valves may be used in lieu of gate valves for piping 2” and smaller except in steam and condensate return systems. Use gate valves for piping 2-1/2” and larger in size.

3.03 VALVE INSTALLATIONS:

A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Valves shall be located in an accessible position or made accessible through access panel.

C. Where several valves are related as to function, they shall be grouped in a battery.

D. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shutdown. Unions are not required on flanged devices.

E. Install a valved bypass around each pressure reducing valve using a globe valve for throttling.

F. Installation of check valves:

1. Swing Check Valves: Install in horizontal position with hinge pin level.

2. Wafer Check Valves: Install between two flanges in horizontal or vertical position.

3. Lift Check Valves: Install in piping with stem upright and plumb.

G. No valve shall be installed with stem below horizontal position without prior approval.

H. Provide special handles or operators as required or as indicated on the drawings.

I. Valves specified under specific systems shall take precedence over those as specified herein.

J. Valves in copper pipe shall have threaded ends (except where size dictates flanged ends), use copper to MPT adapters as required.

K. Provide non-slam type check valves at pumps.

3.04 FIELD QUALITY CONTROL:

A. Testing: After piping systems have been tested and put into service but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

3.05 ADJUSTING AND CLEANING:

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

3.06 VALVE BOXES

A. Valves located below slabs or grade shall be housed in cast iron boxes and covers. Covers shall be properly identified as to service controlled by the valves.

B. Furnish Owner with proper key or valve operator extension.

END OF SECTION

SECTION 22140

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for pipe and pipe fittings.

1.02 REFERENCE STANDARDS

A. ANSI A21.4

B. ANSI A21.11

C. ANSI A21.51

D. ANSI B16.3 Malleable Iron Threaded Fittings

E. ANSI B16.4 Cast Iron Threaded Fittings

F. ANSI B16.5 Pipe Flanges and Flanged Fittings

G. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

H. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings–DWV

I. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

J. ASTM A105 Forgings, Carbon Steel, for Piping Components

K. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

L. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

M. ASTM A536 Ductile Iron Castings

N. ASTM B32 Solder Metal

O. ASTM B88 Seamless Copper Water Tube

P. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

Q. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

R. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

S. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

T. ASTM D2464 Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

U. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

V. ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

W. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

X. ASTM D2657 Heat Fusion Joining of Polyolefin Pipe and Fittings

Y. ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

Z. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

AA. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

BB. ASTM D3222 Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials

CC. ASTM D4101 Propylene Plastic Injection and Extrusion Materials

DD. ASTM F437 Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80

EE. ASTM F438 Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40

FF. ASTM F441 Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80

GG. ASTM F493 Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings

HH. ASTM F656 Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

II. ASTM F1476 Performance of Gasketed Mechanical Couplings for Use in Piping Applications

JJ. AWS A5.8 Brazing Filler Metal

KK. AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water

LL. AWWA C105 Polyethylene Encasement for Ductile Iron Piping for Water

MM. AWWA C110 Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids

NN. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

OO. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids

PP. AWWA C153 Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids

QQ. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

RR. AWWA C606 Grooved and Shouldered Joints

SS. AWWA C651 Disinfecting Water Mains

TT. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

1.03 SUBMITTALS

A. Provide schedule indicating the ASTM or AWWA specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

B. Provide statement from manufacturer that pipe furnished meets the ASTM or specification contained in this section.

C. Grooved joint couplings and fittings shall be shown on product submittals, and shall be specifically identified with the applicable style or series designation.

1.04 QUALITY ASSURANCE

A. Pipe materials shall bear label, stamp, or other markings of specific testing agency.

B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

C. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

D. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.06 SYSTEM CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM or AWWA specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

D. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

E. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER

A. ABOVE GROUND:

1. Type L copper water tube, H (drawn) temper, ASTM B88;

a. Solder joint; wrought copper ASME B16.22 pressure fittings; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

b. Press-connect; ASME B16.51 cast copper alloy, wrought copper, and wrought copper alloy press-connect pressure fittings, EPDM O-rings.

2. (Water Service Entrance) Ductile iron pipe, thickness Class 53, AWWA C151/C115; with standard thickness cement mortar lining, AWWA C104; ductile iron mechanical grooved cement mortar lined fittings and couplings on cut grooved pipe, Class 350 12" and below, Class 250 above 12", AWWA C606; ductile iron or gray iron flanged cement mortar lined fittings, Class 250, AWWA C110; rubber gasket joints with non-toxic gasket lubricant, AWWA C111.

B. BELOW GROUND 2-1/2" AND SMALLER: Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ASME B16.18; wrought copper pressure fittings, ASME B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ASME B16.26.

C. BELOW GROUND 3" AND LARGER:

1. Ductile iron pipe, mechanical or push on joint, thickness Class 52, AWWA C151; with standard thickness cement mortar lining, AWWA C104; ductile iron or gray iron mechanical joint cement mortar lined fittings, Class 250, AWWA C110; ductile iron mechanical joint compact fittings, Class 350, AWWA C153; rubber gasket joints with non-toxic gasket lubricant, AWWA C111. Provide 8 mil tube or sheet polyethylene encasement of iron pipe and pipe fittings, AWWA C105.

2. PVC pressure pipe, DR 18, Class 150, AWWA C900 and C905; with integral bell and elastomeric gaskets, ASTM D3139. Fittings and fitting polyethylene encasement to be same as noted above for ductile iron.

D. THRUST RESTRAINTS FOR UNDERGROUND PIPING: Asphaltic or epoxy coated ductile iron follower gland mechanical joint restraint with gripping wedge restraints and

torque limiting twist-off nuts around the pipe circumference, low alloy steel T-bolts and UL listing or Factory Mutual approval. For PVC pipe joint bells, use epoxy or primer coated ductile iron bell and serrated ring restraints or gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference with low alloy steel tie bolts. Restraint to have minimum pressure rating and safety factor equal to or greater than pressure rating and safety factor of pipe and be designed specifically for the pipe material it is applied on.

2.02 DIELECTRIC UNIONS AND FLANGES

A. Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

B. Victaulic Series 47, dielectric waterway fittings to 8”, threaded or grooved ends, electroplated steel or ductile iron casing, with inert thermosplastic lining having a pressure rating to 300 psig at 230 degrees F.

2.03 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be Teflon type. Treated paper gaskets are not acceptable.

B. 2" AND SMALLER STEEL:

1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.

2. 2" AND SMALLER COPPER: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

C. 2-1/2" AND LARGER STEEL: ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full-face gaskets. Use ANSI B16.1 flat face flanges with full face Teflon gaskets for mating with other flat face flanges on equipment. Gaskets shall be teflon type.

D. 2-1/2" AND LARGER COPPER: ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

E. Fittings used on galvanized steel pipe to be ductile iron A536, with galvanized finish, ASTM A153. Fittings used on ductile iron pipe to be cement mortar lined ductile iron with coal tar coating, ASTM A536; conforming to requirements of AWWA C110/C153 and AWWA C606. Fittings used on copper tube to be copper tube dimensioned wrought copper ANSI B16.22 or cast bronze ASNI B16.18. Fittings used on stainless steel shall be ASTM A403 or factory fabricated ASTM A312.

F. Gaskets to be EPDM, ASTM D1330. Gaskets for hot water systems and dry pipe systems to be flush seal design. Heat treated carbon track bolts and nuts, ASTM A183, with zinc

electroplated finish ASTM B633, or stainless steel ASTM F593.

G. Gaskets used on potable water systems shall be UL classified in accordance with ANSI/NSF-61 for potable water service.

H. Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used. Victaulic Style 741 (steel pipe), 341 (AWWA ductile iron pipe) or 641 (copper tubing).

PART 3 - EXECUTION

3.01 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.02 INSTALLATION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping. All piping shall be concealed in areas with ceilings.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the Engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same

requires the piping services indicated in this section.

3.03 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

B. Grooved joints for copper tubing shall be made at copper tube dimensions. (Flaring of tube ends to accommodate alternate sized couplings is not permitted).

C. Join copper tube and press connect fittings with tools recommended by fitting manufacturer.

3.04 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.05 MECHANICAL JOINT PIPE CONNECTIONS

A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.06 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.07 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install exterior water piping below predicted frost level in accordance with State Plumbing Code, but in no case less than 3' bury depth to top of pipe. Maintain minimum of 8' horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC

water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10' from sewer in both directions.

C. Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Field apply continuous anti-corrosion coating to rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover. Cover with 8 mil sheet or tube polyethylene material sleeve.

D. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

E. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

F. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.08 DIELECTRIC UNIONS AND FLANGES

A. Install dielectric unions, waterway fittings, or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.09 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

B. Union and flanges for disconnect and servicing area not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).

3.10 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the Owner's representative. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Below Ground Domestic Water	Water	N/A	200 psig 2 Hour
Above Ground Domestic Water	Water	N/A	100 psig 8 Hour
Above Ground Non-Potable Water	Water	N/A	100 psig 8 Hour
Below Ground Non-Potable Water	Water	N/A	100 psig 8 Hour

END OF SECTION

SECTION 22150

SANITARY WASTE AND VENT

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for sanitary waste and vent plumbing pipe and pipe fittings.

1.02 REFERENCE STANDARDS

ANSI A21.4

ANSI A21.11

ANSI A21.51

ANSI B16.3 Malleable Iron Threaded Fittings

ANSI B16.4 Cast Iron Threaded Fittings

ANSI B16.5 Pipe Flanges and Flanged Fittings

ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

ASTM A74 Cast Iron Soil Pipe and Fittings

ASTM A105 Forgings, Carbon Steel, for Piping Components

ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A234 Pipe Fittings-Wrought Carbon Steel & Alloy Steel for Moderate & Elevated Temperatures

ASTM A861 High Silicon Iron Pipe and Fittings

ASTM A888 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

ASTM B32 Solder Metal

ASTM B88 Seamless Copper Water Tube

ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM B306 Copper Drainage Tube (DWV)

ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

ASTM C76 Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe

ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings

ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

ASTM D3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM D3222 Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials

ASTM D3311 Drain, Waste and Vent (DWV) Plastic Fitting Patterns

ASTM F2618 Standard Specification for Chlorinated Poly Vinyl Chloride (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems.

AWS A5.8 Brazing Filler Metal

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT

A. INTERIOR ABOVE GROUND:

1. Hubless cast iron soil pipe and fittings, ASTM A888; ASTM A74. Provide heavy duty, shielded stainless steel bands and tightening devices with ASTM Standard C564 rubber sleeve, ANACO/HUSKY SD 4000 / IDEAL TRIDON Heavy Duty.

2. Solid Wall SCH 40 PVC pipe and fittings.

3. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

B. INTERIOR BELOW GROUND:

1. Solid Wall SCH 40 PVC or Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564.

C. EXTERIOR BELOW GROUND 15" AND SMALLER:

1. Solid Wall SCH 40 PVC or Cast iron soil pipe and fittings, ASTM A74; with neoprene rubber compression gaskets, ASTM C564.

2.02 SUBMITTALS

A. Provide schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

B. Provide statement from manufacturer that pipe furnished meets the ASTM specification contained in this section.

2.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specific testing agencies.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

2.04 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

2.05 SYSTEM CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

E. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S

may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

F. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 3 - EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 INSTALLATION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panel boards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing

both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 MECHANICAL HUBLESS PIPE CONNECTIONS

A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturer's recommended torque.

3.07 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.08 SANITARY WASTE AND VENT

A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4" per foot for 2” and smaller piping and 1/8" per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 3 feet bury depth to top of pipe wherever possible.

C. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

3.09 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the local authority having jurisdiction. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Sanitary Waste & Vent	Water	N/A	10’ Water 2 Hour

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. The intent of these specifications and the accompanying drawings is to provide complete and workable systems as shown, specified and required by applicable codes.

1.2 CODES

A. All material and equipment provided and installed as part of these construction documents shall be in compliance with the latest edition of the adopted codes and applicable standards by the State in which the work is performed.

1.3 RESPONSIBILITY

A. The Construction Manager/General Contractor (CM/GC) shall be responsible for all work included in Division 22. The delegation of work to the contractors shall not relieve him of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.4 PERMITS

A. Obtain and pay for permits, fees, certificates of inspection and approval, etc. required for this work. Furnish Owner with certificates of final inspection and approval prior to final acceptance of the work.

B. Laws and regulations which bear upon or affect the work shall be complied with.

1.5 SITE VISIT

A. Prior to preparing the bid, the mechanical plumbing subcontractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and all other matters which can affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 OUTAGES

A. For all work requiring an outage, the plumbing contractor shall submit an outage request to the Architect / Owner.

B. The existing plumbing system shall remain operational unless coordinated with the Architect / Owner during the construction of the project.

C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance. Outages shall be performed so as to minimize disruption to the owner. If necessary, some outage work may be performed outside normal hours if approved by Owner.

D. All plumbing outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon by the contractor and the Owner.

E. The plumbing contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the Owner.

1.7 REQUESTS FOR INFORMATION

A. Submit all questions, requests for information (RFIs) and similar queries through the formally established RFI process for the project that has been accepted by the Owner's Representative, Design Professionals, CM/GC, and subcontractors.

1.8 SUBMITTALS

A. Provide submittals for all material, equipment and supports as specified in Division 22 and where indicated on the drawings and details. At a minimum the following submittals shall be provided as required by the project unless otherwise noted:

1. Pipe, fittings and accessories
2. Valves, strainers and unions
3. Insulation
4. Hangers and supports
5. Plumbing fixtures and trim
6. Safety fixtures and equipment
7. Backflow preventers
8. Identification labels and tags
9. Floor drains

10. Roof drains
11. Hot water heating equipment
12. Trap priming system
13. Plumbing pumps
14. RO/DI equipment and pipe
15. Laboratory compressed air system
16. Laboratory vacuum system
17. Laboratory gas outlets

B. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Product Submittals.

C. The Contractor shall provide to the Architect for review electronic copies of required submittals, in PDF format, unless noted otherwise. All Catalog Data, Shop Drawings, Calculations, and Certificates of Compliance shall be submitted as a single package. Failure of the contractor to provide a complete submittal package may result in delay in processing time. All such delays to the job resulting from the contractor's failure to provide submittals at one time will be the responsibility of the Contractor. Submittals shall clearly identify the contract documents specification section or drawing referenced, identifying and highlighting each item to be reviewed.

D. Submittals provided for review shall clearly and completely describe the specific product(s) they represent. Where differences exist between the item specified and that submitted for review, the submittal shall be highlighted.

E. Submittals shall bear the review stamp of the Contractor. The review stamp of the Contractor shall be affixed to shop drawings to indicate:

1. The Contractor has coordinated the electrical characteristics of the equipment.
2. The Contractor has verified that the equipment submitted will physically fit into the space allocated with adequate clearances for maintenance, access, and egress requirements.
3. The Contractor shall bear all associated costs that may accrue due to failure to completely represent a given product.

F. Material and equipment shown on the drawings or specified herein shall not be incorporated in the work of this Contract until shop drawings, engineering data, and catalog information have been reviewed and accepted by the Engineer.

G. The installing contractor shall maintain as-built drawings; and, shall provide the complete set at the time of final close out. As-built drawings are to be provided, in PDF format on compact disk or DVD.

1.9 VARIANCES

A. Where variances occur between the drawings and specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the contract price. The Engineer shall decide on the item and manner in which the work shall be provided.

1.10 PERFORMANCE REQUIREMENTS

A. Contract drawings are generally diagrammatic and do not indicate all offsets, fittings, transitions, access panels and other specialties required. Furnish and install all items as may be required to fit the work to the conditions encountered. Install all new work in such manner as to conform to the structure, avoid obstructions, provide required service clearances and preserve headroom. Do not scale from drawings, all measurements should be taken in the field.

B. Arrange plumbing piping, equipment and other work generally as shown on the contract drawings, providing proper clearances and access.

C. Coordinate all work with all other contractors and installers in addition to existing building obstructions and install accordingly. Comply with requirements of architectural drawings including but not limited to mounting height and locations. Fully research peculiarities and limitations of space available for installation of work with materials being provided. Work around material lead times to not extend project schedule.

1.11 QUALITY ASSURANCE

A. Contractor shall have a minimum five (5) years experience in the installation of systems similar to the systems specified. Contractor, if requested, shall demonstrate his ability to perform all work to be included under the contract. Assurance if requested, shall be in the form of a list of past projects of similar size and complexity and a list of six (6) references pertaining to those projects. Failure to demonstrate these quality assurances shall be taken as a statement of the contractor’s inability to perform.

1.12 WARRANTY / GUARANTEE

A. Provide a warranty/guarantee in written form as part of O&M manual stating that all work, materials, equipment and parts are warranted to be free of defect for a minimum period of one year from the date of Substantial Completion. Warranty period and requirements may be expanded in drawings or subsequent specification sections. Repair or replace (owner’s option) any defects or failures at no cost to the owner within the warranty period. Issues arising within warranty period must be attended to in a timely manner and in no case exceed four (4) working days. State this in writing as part of O&M manual. Replace defective items to the satisfaction of the Owner's Representative and the Design Professional.

PART 2 PRODUCTS

2.1 GENERAL

A. The listed manufacturers represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable. Contractors may submit material and equipment by non-listed manufacturers provided submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the Engineer.

B. Provide materials that are new, full weight, and of the best quality. Obtain equipment, components and materials from single manufacturer for products of the same kind or category. Provide materials that are listed and labeled and marked for intended location and application.

C. The equipment layouts and the related mechanical and electrical service connections, access space and supports indicated on the construction documents represent equipment provided by the specified basis of design manufacturer and model number. When the successful bidder chooses to provide equipment by another approved manufacturer, the bidder shall be responsible for providing all adjustments and modifications to the services necessary to make connections to the equipment, the bidder shall be responsible for installing the equipment such that all required clear access space is maintained, and the bidder shall be responsible for providing all adjustments and modifications to the equipment mounting and supports. All adjustments and modifications shall be provided by the bidder and appropriate subcontractors at no additional cost to the project.

PART 3 EXECUTION

3.1 GENERAL

A. Unless specifically indicated, provide all specified and drawn work as required to render all equipment and systems fully operational, including all ancillary, accessory, and support work. Install equipment and materials in strict accordance with manufacturer's written instructions.

B. In cases where products or materials are furnished by Owner or others, provide the following services: receive, transport and securely store materials on site; remove materials and components from packaging; assemble all materials and components per factory instructions; install, wire and connect materials and components as recommended by manufacturer for a fully operational installation.

C. Examine surfaces to receive products for suitable mounting conditions and verify compliance with installation tolerances and other conditions affecting performance of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Equipment shall be installed in accordance with manufacturer's installation recommendations. Provide and maintain service, maintenance and operating clearances as required by the manufacturer.

E. Workmanship throughout shall conform to the standards of best practice and all labor employed must be competent and qualified to do all the work required.

3.2 COORDINATION ITEMS

A. Coordinate sizes and locations of concrete housekeeping pads with architectural and structural elements. Concrete housekeeping pads shall be provided with all equipment provided. Concrete shall be 3,500 psi twenty-eight (28) day compressive strength concrete with reinforcement bars as specified in the architectural specifications.

B. Cut and drill all openings in roofs, walls, and floors required for the installation. Neatly patch all openings cut. Hold cutting and patching to a minimum by arranging with other contractors for all sleeves and openings before construction is started. When drilling/cutting concrete slabs, utilize ground penetrating radar (GPR) and/or X-ray scanning equipment to verify the location is free from obstructions, including but not limited to: structural rebar/strands/tendons, electrical conduit/wiring, and/or piping/ductwork.

3.3 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Receive, inspect, store and protect all materials required for new work. Do not accept or install any product damaged in any way.

B. Comply with all manufacturer guidelines and requirements for movement, storage, and protection of new work. All new work must be stored in a clean, dry place protected from weather and construction traffic. Maintain acceptable temperature and humidity per manufacturer recommendations.

C. Prior to installation, all products shall have the ability to be returned to the supplier or manufacturer after purchase and charged a reasonable restocking fee equal to a small portion of the cost.

D. Protect all new work through construction from damage. Take safeguards necessary to protect from damage. Items damaged during construction will not be accepted and shall be replaced with new.

E. Remove and replace all materials that have been installed improperly, physically damaged, moisture or water damaged, or mold damaged.

F. Protect drains throughout all phases of construction to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

G. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.4 EXCAVATING AND BACKFILLING

A. Perform all excavation and backfilling required for admittance of work. Execute work safely providing slope sides, shoring and bracing as required for stability.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations. Properly restore streets, sidewalks, concrete and blacktop surfaces that were broken during the excavation process.

C. Underground drainage piping shall be laid on a 6” of well-tamped bedding course of a sand/gravel mix with a maximum 3/8” particle size. Bedding shall be scooped out at the bells or couplings to ensure the piping is well supported throughout its entire length. Sand/gravel mix should be firmly compacted under, around, and above the pipe in 6” lifts to grade. Compaction should be a minimum of 95 percent of standard proctor according to ASTM D698.

D. Underground piping installations shall conform with ASTM D2321/F1668 and CISPI 301.

E. Install piping materials in accordance with the manufacturer’s requirements and in conjunction with the standards referenced in this specification. Installation methods shall comply with the more restrictive standards.

3.5 STARTUP, TESTING, AND ADJUSTMENTS

A. Adjust fixtures, equipment, accessories, and moving parts to function smoothly and lubricate as recommended by manufacturer.

B. Provide necessary power to fixtures, equipment, and accessories to ensure proper functionality.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.6 CLEANING EQUIPMENT AND PREMISES

A. Vacuum, clean and wipe down all new work and equipment inside and out. Exposed parts which are to be painted shall be cleaned of all foreign objects and prepped for paint.

B. During the progress of work, clean up and leave the premises and portions of the building in which work has occurred in a clean and safe condition. Provide this cleaning on a per-shift basis.

3.7 DEMONSTRATION / TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment.

END OF SECTION

SECTION 22 05 05

SELECTIVE DEMOLITION FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. This section describes the demolition, removal, relocation, rerouting, and reconnection of existing plumbing fixtures, equipment, and related piping and supports, as required, shown and specified herein, to accomplish alteration, restoration and to accommodate new construction.

B. The work shall include but not limited to, draining, disconnecting, relocating, removing and dismantling, in a neat and workmanlike manner, the items and their accessories as indicated or shown on the contract drawings.

1.2 REFERENCES

A. ANSI A10.6 – Safety Requirements for Demolition

B. National Association of Demolition Contractors (NADC) – Demolition Safety Manual

C. NFPA 51B – Cutting and Welding Processes

D. NFPA 70 – National Electrical Code

E. NFPA 241 – Safeguarding Building Construction and Demolition Operations

F. OSHA 29 CRF 1910 – Occupational Safety and Health Standards

G. US EPA – Clean Air Act Amendment of 1990

1.3 SUBMITTALS

A. Demolition Schedule

B. Fire Watch Procedures

C. Inspection Report of Underground Piping Systems

D. Welding/Burning Permit

1. Obtain a welding/burning permit from the local Fire Official prior to the start of any welding or burning in accordance with the local Fire Code or as required by the Owner.

1.4 QUALITY ASSURANCE

A. Cutting, patching, and removal shall be performed by workers skilled in the specific trades involved.

B. Prior to start of work, contractor will make an inspection of job site accompanied by the Engineer.

   1. This inspection will include, but not limited to, verification of site conditions and determining physical condition of construction that is to remain.

C. The plumbing contractor shall also review the architectural demolition drawings for additional information and requirements.

1.5 SPECIAL PRECAUTIONS

A. Torch cutting of plumbing equipment and pipe will be permitted only as directed by the Engineer.

B. Any cutting method, which may create sparks, must include Fire Watch Procedures as required by State and local code or Owner's fire insurance carrier. Submit Fire Watch Procedures for approval.

C. Any draining operations must not damage building components.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide adequately sized rubbish containers for the proper and safe disposal of all debris.

PART 3 EXECUTION

3.1 GENERAL

A. Provide alteration and demolition of plumbing facilities as required by the contract drawings and specifications. The drawings are diagrammatic and do not show the exact location of all existing plumbing work. Where existing equipment shall remain in service during construction, provide rerouting and reconnection of plumbing as required to maintain continuous service.

B. Review all equipment with the engineer and owner prior to disposal. Existing plumbing to be abandoned that are not embedded in walls or floor slabs shall be completely removed unless otherwise shown on the drawings. Cap open ends at all walls and floors.

C. Remove, store and protect all equipment or materials to be reused by the owner as shown on the drawings. Coordinate location of storage with the owner. Items indicated to be removed, and not

designated for owner's salvage and reuse, may be salvaged by the contractor. Transport salvaged items that are not to be reused from site as they are removed. Storage or sale of removed items on site will not be permitted.

D. Temporarily cap ends of sanitary and sanitary vent piping to avoid entry of dirt, debris, or discharge of foul odors and gases.

E. Do not close or obstruct egress width to exits. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walkways, occupied areas, and other adjacent occupied or used facilities. Ensure safe passage of persons around or through area of demolition operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

F. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to the engineer and owner.

G. Conform to procedures applicable when discovering hazardous or contaminated materials.

H. Conduct demolition to minimize interference with adjacent building structures or owner's operations.

I. Cease operations immediately if structure appears to be in danger or hazardous materials are encountered. Notify architect and engineer and do not resume operations until directed.

J. Demolish in an orderly and careful manner. Do not cut or remove more than is necessary to accommodate the new construction or alteration.

K. Remove demolished materials from site daily. Do not burn or bury materials on site. Dispose of all material at an approved disposal facility.

L. Cover and protect floors, furniture, equipment and fixtures to avoid soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed. Protect finished surfaces at all times and repair or replace, if damaged, to match existing construction to the satisfaction of the owner.

M. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

N. Protect new and existing roofs from damage.

O. Do not interrupt existing utilities serving occupied portions of the facility, except when authorized in writing by owner's representative. Provide temporary services during interruptions to existing utilities, as acceptable to the owner. Contractor shall disconnect and seal only utilities to be demolished serving areas being demolished, prior to start of demolition work. If contractor is required to disconnect utility services or other services to an occupied area, the contractor shall provide temporary or alternative service to that area, as acceptable to the owner.

3.2 PREPARATION

A. Construct temporary partitions prior to any demolition work enclosing respective work. Erect temporary fencing and signage around demolished materials. Use water sprinkling and other suitable methods to limit dust and dirt arising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Protect existing materials and equipment which are not to be demolished.

C. Provide any required bracing and shoring to prevent movement of structure.

D. Do not begin the work until the time schedules and manner of operations have been approved by the engineer and owner. All interruptions of existing services shall be included in the schedules as approved by the engineer and owner.

3.3 PIPE REMOVAL

A. Cut off all welded piping square at the locations indicated on the drawings. No cutting will be required where the demolition ends at a flanged valve or equipment. Close off all openings of any remaining valves, piping or fittings with weld caps or blind flanges to prevent debris from entering the existing system.

B. Disconnect all threaded piping at the location indicated on the drawings. Close off all openings of remaining valves, piping, fittings and equipment with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.

C. Remove all pipe hangers, supports, miscellaneous steel and anchors with the piping.

3.4 PROTECTION FROM FREEZING

A. It is intended that the building remain protected from damage due to freezing temperatures. To that end, existing equipment and systems used for heating shall remain in place and in operation until scheduling permits shutdown.

B. Where the removal of equipment and existing systems will leave an area unprotected from freezing, notify the owner and engineer at least 72 hours in advance prior to removal so appropriate steps can be taken by the owner to protect the area. Provide temporary heating equipment sufficient to prevent freezing.

C. It is the contractor’s responsibility to ensure that piping systems that are being worked on are completely drained of water prior to the start of demolition. If water is not drained and the piping freezes, it is the contractor’s responsibility to replace piping at his own expense.

3.5 DISCONNECTION AND INTERRUPTION OF PLUMBING SERVICES

A. When portions of an existing piping systems are removed, and this removal causes loss of operation to another piece of equipment due to open (disconnected) piping, then cap piping or provide temporary piping to retain operation of various systems.

3.6 PLUMBING EQUIPMENT REMOVAL

A. Remove all plumbing equipment as shown on the contract drawings. Coordinate removal of all electrical work, including wiring between equipment, and wiring to power source or point of origin with electrical contractor.

B. Where equipment is supported by steel or structural supports, remove these supports.

3.7 INSULATION REMOVAL

A. Remove insulation, together with all piping, fittings, valves and equipment designated for demolition.

END OF SECTION

220548: VIBRATION ISOLATION AND SEISMIC RESTRAINT FOR PLUMBING COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The work under this section is subject to the requirements of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements.

Specifications throughout all Divisions are directly applicable to this Section, and this Section is directly applicable to them. In the event that this section conflicts with the requirements of other Sections, the more stringent criteria shall apply.

1.2 DESCRIPTION

This section includes requirements for vibration isolation and seismic restraint of nonstructural components in Risk Category I, II, III, & IV structures, including, but not limited to:

Plumbing Components: Gas piping; water piping; waste or vent piping; water heaters, etc.

Work in this section includes the restraint design and/or equipment/product certifications to be submitted for review by the registered design professional.

1.3 DEFINITIONS

Active Equipment: Equipment with dynamic moving or rotating parts or parts that are energized.

Attachments / Anchorage: Means by which nonstructural components or supports for nonstructural components are secured or connected to the seismic-force resisting system of the structure. Such attachments may include anchor bolts, welded connections, mechanical fasteners or other approved attachment devices. Friction attachments do not constitute positive attachments.

Bracing: Struts, braces, cables, anchors or other structural elements providing restraint for nonstructural components to prevent excessive movement.

Certificate of Compliance: A certificate, supplied by the component manufacturer, stating that materials and products meet specified standards and project specific requirements.

Component Importance Factor (I_p): Factor applied to a component that defines the criticality of that component. This factor can be 1.0 or 1.5 in accordance with ASCE 7, Section 13.1.3.

Consequential Damage: Failure of an essential component caused by the failure of a separate essential or non-essential component due to the functional and physical interrelationship of the components, their supports, and their effect on each other.

Designated Seismic System: Those nonstructural components that require design in accordance with Chapter 13 of ASCE 7, for which the Component Importance Factor (Ip) is 1.5 in accordance with Section 13.1.3 of ASCE 7.

Special Seismic Certification: A certificate of compliance, supplied by the manufacturer of Active Designated Seismic Systems, which certifies that the equipment will remain operable during the design seismic event. Components with hazardous contents shall be certified as maintaining containment following the design seismic event.

Structure: The load-bearing building elements designed by the Structural Engineer of Record. Non-load bearing partition walls, unreinforced slabs or other building elements that do not provide direct load transfer to the load-bearing building elements shall not be defined as part of the Structure and cannot be used for attachment of seismic restraints.

Supports: Those members, assemblies of members, or manufactured elements, including braces, frames, legs, snubbers, curbs, rails, hangers, saddles or struts, and associated fasteners that transmit loads between non-structural components and their attachments to the structure.

1.4 REGULATORY REQUIREMENTS

Comply with the 2015 International Building Code (IBC) and applicable local adopted amendments, and the 2010 Edition on ASCE 7 (ASCE 7-10).

1.5 DESIGN PERFORMANCE CRITERIA

Provide seismic restraint of components to withstand seismic forces and displacements without displacing or overturning. Design of seismic restraint shall be performed in accordance with the 2015 International Building Code and ASCE 7-10, as follows.

1. Seismic forces shall be determined in accordance with Chapter 13 of ASCE 7-10. The seismic design parameters shall be as noted in the project Structural drawing. The assigned Component Importance Factors (Ip) for each component, shall be as noted on the project drawings and/or specifications.

2. For components installed on the exterior of the building, wind forces shall be determined in accordance with Chapter 29 of ASCE 7-10, except that the uplift forces per Equation 29.5-3 shall be considered regardless of the building height. Reference the Structural drawings for wind design criteria.

3. In addition to seismic and wind loads, consideration shall be given to other loads, including but not limited to dead, live, snow, etc., as applicable. All restraint design shall be based on the “worst case” combination of the applicable loads as prescribed by the referenced code and standards.

4. Consideration shall also be given to thermal stresses and expansion. Where thermal expansion applies, seismic restraint design shall be in accordance with the requirements of ASME B31.1 in addition to ASCE 7.

1.6 SUBMITTALS

Submit under the provisions of Division 1. Submittals shall include Product Data, Shop Drawings and the required Certificates of Compliance as described below.

Shop drawings shall be prepared and sealed by a professional engineer licensed in the state of the project, with a minimum of 5 years of experience in the design of vibration isolation and seismic restraint.

Vibration Isolation: submit the following, at a minimum, as applicable.

1. Detailed schedules of equipment requiring isolation, including clearly identified equipment identification or tag and equipment weight, and corresponding isolator type, manufacturer and model number.

2. Detailed drawings showing equipment, isolator bases and isolator spacing.

3. Descriptive data or cut sheets for each type of isolation mounting, including:

    a. Dimensional data

    b. Materials and finish

    c. Rated loads

    d. Rated deflection

    e. Isolator free and operating heights

    f. Detailed installations instructions

Seismic Restraint: submit the following, at a minimum, as applicable.

4. Catalog cut or data sheets on specific restraints detailing compliance with the project drawings and specifications.

5. Detailed schedules of components, showing seismic restraints by referencing numbered descriptive drawings.

6. Description, layout and location of items to be restrained with anchorage or brace points noted and dimensioned.

7. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, fasteners, bolts, welds etc. clearly identified and specified.

8. Numerical value of design seismic restraint loads, or controlling loads if different than load combinations with seismic, with all supporting calculations.

9. Detailed installation instructions for seismic restraints.

10. Acceptable attachment methods of seismic restraints to structural members.

11. Fabrication details for equipment bases including dimensions, structural member sizes and support point locations.

12. Details for housekeeping pads for base-mounted equipment, including reinforcing and doweling requirements to the building structure.

13. Documentation verifying seismic prequalification for anchors in concrete per ACI 318 Appendix D.

14. Additional information as required to substantiate adequate design and installation of seismic restraints.

15. Manufacturer's Seismic Certificate of Compliance: Each manufacturer of a Designated Seismic System (with a Component Importance Factor, Ip = 1.5) shall submit a ***Certificate of Compliance*** for review and acceptance by the design professional in responsible charge and the authority having jurisdiction, prior to installation.

PART 2 - PRODUCTS

2.1 GENERAL

All materials and devices shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

Refer to the “Selection Guide” table in Section 4 to correlate the specification references listed below with the appropriate components.

2.2 MANUFACTURERS

Isolators and seismic restraints shall be from the following manufacturers, or approved equals. Unless otherwise noted, the isolators and seismic restraint systems listed in the following sections are as manufactured by Gripple and California Dynamics.

1. Gripple
2. California Dynamics
3. The VMC Group
4. Mason Industries
5. Kinetics Noise Control
6. Cooper B-Line
7. CADDY
8. Hilti
9. Twin City Hose
10. Imperial Metals

2.3 EQUIPMENT BASES

Specification B-1 (Integral Structural Steel Base): Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Pump bases for split case pumps shall be large enough to support suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1". Bases shall be type XW as manufactured by California Dynamics Corporation or approved equal.

Specification B-2 (Wide Flange Structural Steel Base): Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Pump bases for split case pumps shall be large enough to support suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1". Bases shall be type XW as manufactured by California Dynamics Corporation or approved equal.

Specification B-3 (Concrete Inertia Base): Rectangular steel concrete pouring forms for floating concrete frames. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6". The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place on 12" centers running both ways in a layer 1 1/2" above the bottom. Height saving brackets shall be employed in all mounting locations to maintain a 1" clearance below the base. Base shall be type CW as manufactured by California Dynamics Corporation or approved equal

Specification B-4 (Non-Isolated Curbs): Non isolated seismically rated rooftop curb system that is flashed into roofing membrane. Air and watertight curb shall have a neoprene sponge seal at the top and be rigid enough to provide continuous perimeter support for rooftop unit. Curb must provide means to positively anchored to concrete deck, or bolted or welded directly to structural steel to withstand seismic loading. Curb shall provide a means by which contractor supplied insulation may be installed for thermal insulation and acoustic attenuation. Curbs shall accommodate roof pitch shown on drawings. **Curb shall use minimum 18 gage galvanized steel and shall be designed with crossbracing required to withstand the greater of calculated seismic forces and /or wind loading per local building code**. Design must be certified by registered professional engineer.

Specification B-5 (Isolated Curbs): Seismically rated rooftop isolation curb system that is flashed into roofing membrane. Standard unit curb will not be used. Air and watertight upper curb shall have a neoprene sponge seal at the top and be rigid enough to provide continuous perimeter support for rooftop unit. The upper curb shall be supported by Spec SV-1 isolators welded or bolted to concrete deck to the structure to withstand seismic loading. An EPDM nylon reinforced air tight weatherproof seal shall consolidate the upper and lower curbs. The lower curb shall be weatherproof and provide a base that the roofing system may be flashed to. Weatherproof access panel shall be provided at each isolator to allow isolator adjustment. Isolation curb shall provide a means by which contractor supplied insulation may be installed for thermal insulation and acoustic attenuation. Curbs shall accommodate roof pitch shown on drawings**. Isolation curb shall be designed to withstand the greater of calculated seismic forces and / or wind loading per local building code**. Design must be certified by registered professional engineer.

Specification B-6 (Non-Isolated Rails): Non isolated seismically rated rooftop rail system that provides equipment support in one roof flashed assembly with all features as described for Non-Isolated Curbs.

Specification B-7 (Isolated Rails): Vibration isolation manufacturer shall provide steel members welded to height saving brackets to cradle equipment having legs or bases that do not require a complete supplementary base. Members shall have sufficient rigidity to prevent misalignment of equipment. Structural steel rails shall be type, WW as manufactured by California Dynamics Corporation or approved equal.

2.4 VIBRATION ISOLATION

Specification V-1 (Pad Type Elastomer Isolator): A pad type mounting consisting of two layers of ribbed elastomeric pads with a 1” sandwich pad in between. Where the equipment foot is less than 80 percent of the surface of the pad a load distribution plate must be added to the top of the pad. Pads shall be VT as manufactured by California Dynamics Corporation or approved equal.

Specification V-2 (Neoprene Mounting): Elastomeric mounts single or double-deflection type, oil-resistant rubber or Neoprene isolator element with factory-drilled, bonded in place top plate for bolting to equipment and factory drilled base plate for bolting to structure. Color-coded or otherwise identify to indicate capacity range. Mount shall be type RM/RMD as manufactured by California Dynamics Corporation or approved equal.

Specification V-3 (Spring Isolator, Free Standing): Spring isolators shall be free standing and laterally stable without any housing and complete with a Neoprene acoustical pad between the base plate and the spring support. All mountings shall have load transfer bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Mountings shall be type SSL/K, as manufactured by California Dynamics Corporation or approved equal.

Specification V-4 (Elastomer Hanger Isolator): Hanger shall consist of a rigid steel frame and up to ½"deflection of a molded Neoprene element projecting thru the steel box so that no metal-to-metal contact occurs. Hanger shall be type RH/RHD as manufactured by California Dynamics Corporation or approved equal.

Specification V-5 (Spring Hanger Isolator): Hanger shall consist of a rigid steel frame containing a steel spring with a Neoprene sleeve to prevent steel to steel contact. Hanger shall be type CH as manufactured by California Dynamics Corporation or approved equal

Specification V-6 (Combination Spring/Elastomer Hanger Isolator): Hangers shall consist of rigid steel frames containing double deflection Neoprene element at the top and a steel spring and a Neoprene sleeve on bottom to position spring and prevent steel to steel contact. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side. Hangers shall be type HH30 as manufactured by California Dynamics Corporation or approved equal.

2.5 VIBRATION ISOLATION WITH SEISMIC RESTRAINT

Specification SV-1 (Seismically Restrained Spring Isolator): Restrained spring isolators shall be free standing, laterally stable, springs with seismic restraints. A steel housing with cushioned lateral and vertical limit stops to restrict spring extension due to wind loads, or when weight is removed. The housing shall be Zinc plated. A clearance of ¼" maximum shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Outside spring diameter not less than 80 percent of the compressed height of the spring at rated load. Minimum additional travel 50 percent of the required deflection at rated load. Isolator/Restraint shall be CQA as manufactured by California Dynamics Corporation or approved equal. This product is an OSHPD/ DSA approved product. Product tested for IBS.

Specification SV-2 (Seismically Restrained Spring Isolator): Restrained spring isolators shall be free standing, laterally stable, springs with seismic restraints. A welded housing with cushioned lateral and vertical limit stops to restrict spring extension due to wind loads, or when weight is removed. A clearance of ¼" maximum shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Outside spring diameter not less than 80 percent of the compressed height of the spring at rated load. Minimum additional travel 50 percent of the required deflection at rated load. Isolator/Restraint shall be DLK as manufactured by California Dynamics Corporation or approved equal.

Specification SV-3 (Neoprene Mounting with Seismic Snubber) JQTQN Restrained Neoprene isolators shall be free standing, with a rated static defection of .5". A steel housing with cushioned lateral and vertical limit stops to restrict extension due to wind loads, or when weight is removed. The housing shall be hot-dipped galvanized or zinc plated. Hot-Dipped zinc coating shall be not less than 2 ounces per square foot complying with ASTM A123. A clearance of ¼ "maximum shall be maintained around restraining bolts and between the housing and the Neoprene so as not to interfere with the isolator action. Limit stops shall be out of contact during normal operation. Isolator/Restraint shall be JQTQN as manufactured by California Dynamics Corporation.

2.6 SEISMIC RESTRAINTS

Specification S-1 (Seismic Snubbers): All directional seismic restraints shall consist of interlocking steel members. Neoprene shall have a minimum thickness of ¼". Incorporate a minimum air gap of 1/8", and a maximum air gap of ¼" in the design, before contact is made between the rigid and resilient surfaces. Provide removable end plate to allow inspection of internal clearances. Restraints shall be type RL-A/ RL-C as manufactured by California Dynamics Corporation.

Specification S-2 (Seismic Cable Restraints): A restraint assembly for suspended equipment, piping or ductwork consisting of high strength galvanized steel aircraft cable. Cable Restraints shall be listed with any one of following evaluation agencies with certified break strength and shall be color-coded or include a tag for easy field verification.

1. IAPMO-UES

2. ICC-ES

3. OSHPD

4. Underwriters Laboratories (UL)

Secure cable to structure and braced component through bracket or stake eye specifically designed to meet or exceed cable restraint rated capacity. Cable must be manufactured to meet or exceed minimum materials and standard requirements per ASTM A1023 or EN-12385 or other approved equivalent. Cables shall be installed to prevent excessive seismic motion and so arranged that they do not engage during normal operation. Restraint shall be Gripple Inc. GS series.

Specification S-3 (Rigid Brace Restraints): A restraint assembly for suspended equipment, piping or ductwork consisting of steel angles or channels. Rigid braces and connecting elements shall be sized for the applied seismic loads. Connecting elements shall be steel assemblies that swivel to the final installation angle and utilize two anchor bolts to provide proper attachment. Restraint shall be CADDY Strut Seismic Hinge.

2.7 FLEXIBLE PIPE CONNECTIONS

Specification F-1 (Water Service Flexible Connection):

1. For flanged connections – A double sphere arch rubber expansion joint constructed of molded reinforced neoprene with integral steel floating flanges, and designed to be suitable for pressures up to 225 PSI (4 to 1 safety factor) and temperatures up to 225 degrees F. Connectors shall have minimum movement capabilities of 1.77" compression, 1.18" lateral and 1.18" extension. Connectors shall provide a minimum 35 degree angular movement up to 6", minimum 30 degree up to 12" and minimum 20 degree up to 24". Spring loaded control units shall be furnished to limit movement to within allowables. Flex connector shall be Twin City Hose Type MS2.

2. For threaded type – A double spherical rubber hose connector, minimum 8" long, constructed of molded neoprene, nylon cord reinforced, with female pipe unions each end. Connectors shall have a minimum movement capability of 7/8" compression, 7/8" lateral, ¼" extension and 20 degree angular through 1-1/4", 13 degree through 2", and 9 degree through 3". Connectors shall be suitable for a maximum working pressure (4 to 1 safety factor) of 150 psi and 225 degree F. Connectors shall have cable control units to limit extension to ¼". Flex connector shall be Twin City Hose Type MSFU.

Specification F-2 (Steam and Condensate Service):

3. For flanged connection – A metal hose connector constructed of stainless steel hose and braid with carbon steel plate flanges. Live lengths shall conform to hose minimum length to absorb thermal and dynamic movement. Hose axis must be perpendicular to pipe movement. Flex connector shall be Twin City Hose Type TCHS-FLG.

4. For threaded connections – A metal hose connector constructed of stainless steel hose and braid with carbon steel NPT threaded end fittings. Flex connector shall be Twin City Hose Type TCHS-MMT.

PART 3 - EXECUTION

3.1 EXAMINATION

All areas that will receive components requiring vibration isolation and seismic restraint shall be thoroughly examined for deficiencies that will affect the installation or performance of the installed devices. Such deficiencies shall be corrected prior to the installation.

3.2 INSTALLATION, GENERAL

Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

All installation shall be in accordance with the requirements set forth in the project drawings and specifications, as well as the manufacturer's published instructions and all approved submittal data.

Do not anchor components to gypsum wallboard, plaster or other wall or ceiling finish that has not been engineered to resist imposed loads.

3.3 SEISMIC RELATIVE DISPLACEMENTS

Provide joints with sufficient flexibility capable of accommodating seismic relative displacements as follows.

1. Vertical ductwork, piping, etc. that pass between floors of the building,
2. Components that pass through a building seismic or expansion joint,
3. Rigidly supported components that connect to other components.

3.4 POST-INSTALLED ANCHORS:

Install all anchors in accordance with the manufacturer's written instructions for seismic applications.

Post-installed anchors in concrete shall be seismically prequalified for use in cracked concrete based on seismic testing in accordance with ACI 355.2 for mechanical anchors or ACI 355.4 for adhesive anchors.

3.5 HOUSEKEEPING PADS

Housekeeping pads shall be designed by the seismic restraint vendor with adequate reinforcing and doweling to the building structure, so as to withstand calculated seismic or wind forces. Frictional resistance due to the effects of gravity shall be neglected.

The size & thickness of the housekeeping pad shall be determined to ensure adequate edge distances & embedment depths in order to obtain the desired equipment anchor capacities.

1. If cast-in-place anchors are used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.
2. If post-installed anchors are used, the minimum edge distances, embedment depths and concrete/masonry member thicknesses specified by the anchor manufacturer shall be maintained.

3.6 PLUMBING COMPONENTS

Floor and base-mounted components, vibration isolated equipment and associated system vibration and seismic controls for connections.

1. Design equipment anchorage to resist seismic design force in any direction.
2. Design vibration and seismic controls for equipment to include base and isolator requirements.
3. Provide flexible connections between equipment and interconnected piping to account for seismic relative displacements.

4. Where equipment is mounted on vibration isolators, use isolators designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

5. Provide supplemental steel or concrete base as required for mounting equipment on isolators. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.

6. Where concrete floor thickness is less than required for expansion anchor installation per ICC-ESR, install through bolt in lieu of expansion anchor. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, furnish and install supplemental framing or blocking to transfer loads to structural elements.

7. Housekeeping pads shall be coordinated with the seismic restraint vendor based on the equipment anchorage specified in the seismic design.

Suspended plumbing equipment

8. Design support and bracing to resist seismic design force in any direction.

9. Provide flexible connections between equipment and interconnected piping to account for seismic relative displacements.

10. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.

Wall-mounted plumbing equipment

11. Design attachments to resist seismic design force in any direction.

12. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

Piping

13. Provide supports, braces and anchors to resist gravity and seismic design forces.

14. Design piping and piping risers to accommodate interstory drift. Provide flexible connections wherever relative differential movements could damage pipe in an earthquake.

15. Brace every run (5’ or more in length) with two transverse and one longitudinal bracing locations. For pipes and connections constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections) provide transverse bracing at not more than 40 feet on center and longitudinal bracing at spacing not more than 80 feet on center. For pipes and their connections constructed of nonductile materials (cast iron, no-hub pipe and plastic or non-UL listed grooved coupling pipe), provide transverse bracing at not more than 20 feet on center and longitudinal bracing at spacing not more than 40 feet on center.

16. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.

17. Where piping is explicitly exempt from seismic bracing requirements,

    a. Install piping such that swinging of the pipes will not cause damaging impact with adjacent components. This will be considered satisfied if there is horizontal clear distance of at least 2/3 the hanger length between subject components.

    b. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.

3.7 QUALITY CONTROL

Do not install vibration isolators or seismic restraints until submittals have been reviewed and approved by the registered design professional in responsible charge.

Verify that multiple systems installed in the same vicinity can be installed without conflict.

Verify tolerances between installed items to confirm that unbraced components will not come into contact with restrained equipment or structural members during an earthquake. When contact is possible, provide seismic restraint or provide justification to the satisfaction of the registered design professional in responsible charge of the project that contact will not cause unacceptable damage to the components in contact, their supports, finishes or other elements that are contacted.

Coordinate with the Structural Engineer of Record for confirming that the structure is capable of supporting the loads imposed by nonstructural components.

No work shall be concealed by the Contractor prior to the required inspections being performed and all discrepancies resolved. The Contractor shall be responsible for all repairs required to uncover uninspected or unapproved work.

Where Special Inspections are required per Sections 1704 and 1705 of the 2015 International Building Code, the owner shall engage a qualified agency to perform the required inspections for components listed in the project-specific Statement of Special Inspections.

PART 4 - EQUIPMENT ISOLATION AND SEISMIC RESTRAINT SCHEDULE

PLUMBING EQUIPMENT

EQUIPMENT TAG	Ip (Note 4)	ISOLATION SPEC.	ISOLATION DEFL.	SEISMIC REST. SPEC. (NOTE 1)
ELECTRIC WATER HEATERS	1.0	NONE	N/A	NOTE 2
DOMESTIC WATER	1.0	NOTE 3	N/A	SPEC S-2
WASTE, VENT PIPING	1.0	NONE	N/A	SPEC S-2

NOTES

1. Seismic restraint to be provided only where required in the project drawings.
2. Anchor bolts for non-isolated and internally isolated equipment shall be sized by the seismic engineer. If required, Spec. S-1 snubbers or Spec. S-2 cable kits shall be provided.
3. Provide Type V-6 isolator for the first three hangers from all equipment specified with spring isolation.

4. All components in a Risk Category IV building are assigned a Component Importance Factor I_p equal to 1.5.

END OF SECTION _____

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing,

and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping.
2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Engineer's written permission.

1.7 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type KASTM B 88, Type L, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances:

F. PE, Fire-Service Pipe: ASTM F 714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG Class 200.

1. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

G. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

    a. Gaskets: AWWA C111, rubber.

5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.2 JOINING MATERIALS

A. Refer to Section 330500 "Common Work Results for Utilities" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Nonrising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psi
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

2. Nonrising-Stem, Resilient-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 200 psi.
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

3. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 250 psi.
3) End Connections: Push on or mechanical joint.
4) Interior Coating: Complying with AWWA C550.

4. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psi.
3) End Connections: Flanged.

5. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 200 psi.

B. UL/FMG, Cast-Iron Gate Valves:

1. UL/FMG, Nonrising-Stem Gate Valves:

a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Flanged.

2. OS&Y, Rising-Stem Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Flanged.

C. Bronze Gate Valves:

1. OS&Y, Rising-Stem Gate Valves:

a. Description: Bronze body and bonnet and bronze stem.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psi.
3) End Connections: Threaded.

2. Nonrising-Stem Gate Valves:

a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.

    a. Standard: MSS SP-60.
    b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
    c. Valve: AWWA, cast-iron, nonrising-stem, metal resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

    1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES AND CURB VALVES

A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

    1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
    2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
    3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

    1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

A. Water meters will be furnished by utility company.

B. Displacement-Type Water Meters:

1. Description: With bronze main case.

    a. Standard: AWWA C700.
    b. Registration: Flow in cubic feet.

C. Compound-Type Water Meters:

1. Description:

    a. Standard: AWWA C702.
    b. Registration: Flow in cubic feet.

2.8 BACKFLOW PREVENTERS

A. City of Batesville Specifications.

2.9 WATER METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

B. Description-1: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.

C. Description-2: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

2.10 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.

1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.

    a. Dimension: 24-inch minimum diameter, unless otherwise indicated.

3. Manhole-1: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.

    a. Dimension: 24-inch- minimum diameter, unless otherwise indicated.

4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral

or field-installed bronze ball or clapper-type backwater valve.

2.11 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6START_SIEND_SI mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

    a. Standard: AWWA C502.
    b. Pressure Rating: 250 psig

2. Description-1: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6START_SIEND_SI mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

    a. Standards: UL 246, FMG approved.
    b. Pressure Rating: 250 psig.
    c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
    d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
    e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
    f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

B. Wet-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550.

    a. Standard: AWWA C503.
    b. Pressure Rating: 150 psig minimum.

2. Description-1: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet.

    a. Standards: UL 246 and FMG approved.
    b. Pressure Rating: 150 psig minimum.
    c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
    d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
    e. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.
    f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.12 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-START_SIEND_SI high brass sleeve; and round escutcheon plate.

a. Standard: UL 405.
b. Connections: Two NPS 2-1/2 inlets and one NPS 6 outlet.
c. Connections-1: Four NPS 2-1/2 inlets and one NPS 6 outlet.
d. Connections-2: Six NPS 2-1/2 inlets and oneSTART_SIEND_SINPS 8 outlet.
e. Inlet Alignment: horizontal.
f. Finish Including Sleeve: Rough chrome-plated.
g. Escutcheon Plate Marking: “STANDPIPE."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICAITONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type KASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

F. Underground water-service piping NPS 4 and NPS 6 shall be any of the following:

1. Soft copper tube, ASTM B 88, Type KASTM B 88, Type Lwrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
3. NPS 4 and NPS 6: NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 molded fittings; and gasketed joints.

G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.

H. Aboveground Water-Service Piping NPS 3/4 to NPS 3 shall be hard copper tube, ASTM B 88, Type K, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

I. Aboveground and vault water-service piping NPS 4 and NPS 6 shall be any of the following:

1. Hard copper tube, ASTM B 88, Type KASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

J. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PE, Class 200, fire-service pipe; molded PE fittings; and heat-fusion joints.
3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

K. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

L. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

M. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3START_SIEND_SI and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3START_SIEND_SI and Larger: AWWA, cast-iron,

nonrising-stem, resilient seated gate valves with valve box.
2. Underground Valves, NPS 4START_SIEND_SI and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:

   a. Gate Valves, NPS 2 and Smaller: Bronze, rising stem.
   b. Gate Valves, NPS 3 and Larger: AWWA

3.4 PIPING SYSTEMS – COMMON REQUIREMENTS

A. See Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection-1: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Install PE pipe according to ASTM D 2774 and ASTM F 645.

H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

I. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.

J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

K. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

M. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

A. See Section 330500 "Common Work Results for Utilities" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.

3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Water Meters-1: Install compound-type water meters, NPS 3 and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.11 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface.

B. Install water meter boxes in grass or earth areas with top 2 inchesSTART_SIEND_SI above surface.

3.12 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.13 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.14 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install protective pipe bollards on two sides of each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.15 CONNECTIONS

A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

D. Connect waste piping from concrete vault drains to sanitary sewerage system. See Section 221313 "Facility Sanitary Sewers" for connection to sanitary-sewer piping.

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.17 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Nonpressure-type transition couplings.
4. Pressure-type pipe couplings.
5. Expansion joints and deflection fittings.
6. Backwater valves.
7. Cleanouts.
8. Encasement for piping.
9. Manholes.
10. Concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet and to vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes and Extra-Heavy class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI-Trademark, Shielded Couplings:

1. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:

1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

B. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

E. Nonpressure-Type, Rigid Couplings:

1. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling; molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.5 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
2. Horizontal type; with swing check valve and hub-and-spigot ends.
3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
4. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves:

1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet.

D. Color: natural.

2.8 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inchSTART_SIEND_SI minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: No Steps.
10. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.9 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350, and the following:

1. Cement: ASTM C 150/C 150M, Type II.
2. Fine Aggregate: ASTM C 33/C 33M, sand.
3. Coarse Aggregate: ASTM C 33/C 33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 1064/A 1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A 1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 48-inch minimum cover.
4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.
7. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105/A21.5:

1. Hub-and-spigot, cast-iron soil pipe.
2. Hubless cast-iron soil pipe and fittings.
3. Expansion joints and deflection fittings.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join PVC corrugated sewer piping according to ASTM D 2321.
5. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
6. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

    a. Unshielded flexible couplings for pipes of same or slightly different OD.
    b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits

installation.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 BACKWATER VALVE INSTALLATION

A. Install horizontal-type backwater valves in piping manholes or pits.

B. Install combination horizontal and manual gate-type valves in piping and in manholes.

C. Install terminal-type backwater valves on end of piping and in manholes. Secure units to sidewalls.

3.7 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.8 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

3.10 IDENTIFICAITON

A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 10-footSTART_SIEND_SI head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.

e. Test and inspect joints for leaks.

6. Manholes: Perform hydraulic test according to ASTM C 969

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

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SECTION 23 00 10 - MECHANICAL GENERAL

PART 1 - GENERAL

1.01. CONTRACT DOCUMENTS

A. Drawings are diagrammatic, due to scale, and indicate the general arrangements and geometric relationships of equipment, systems, and services. They are not intended to show or indicate every offset, sequence, device, option, fitting, valve, or accessory. Plan work around building details and other crafts. Do not scale drawings for exact sizes and locations.

B. Contractor shall base all his measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Contractor shall verify all measurements at site and check correctness as related to the work.

C. In case of interferences between trades, Engineer will decide which work is to take precedence regardless of work that might be installed.

1.02. CODES, ORDINANCES, INSPECTIONS AND PERMITS

A. Work is to be executed and inspected in accordance with local and State codes, laws, ordinances, rules and regulations applicable to particular class of work, including the State Mechanical Code, State Plumbing Code, State Gas Code, and State Fire Code. Associated fees shall be paid by the Contractor.

B. Should any part of drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Engineer, in writing, within 72 hours prior to bid deadline for review and/or correction of bid documents. After project bidding is closed, any discovery of code violations shall be promptly reported to the Engineer. Any work performed in violation of applicable codes or ordinances shall be corrected without additional expense to the Owner or his representatives.

C. Pressure and heating vessels, including hot water storage containers, shall be constructed in compliance with the rules and regulations of the Boiler Inspection Division of the State. All installations of such equipment shall be made by a firm licensed and approved by the Boiler Inspection Division of the State.

D. Facilities shall be installed in compliance with the requirements of the current version of the Americans with Disabilities Act (ADA). Installation of mechanical and plumbing systems including fixtures and control mounting heights, clear knee space, and access clearances shall comply with ADA required dimensions, and as shown on details or schedules when shown.

E. Contractor shall arrange with County, City or State, if City has no ordinances covering work, for complete inspection, paying all charges required. Give proper

authority requisite notice relating the work; afford Engineer and authorized inspectors adequate access to the Work for inspection; and be responsible for all violations of law. Upon completion of work, have work inspected, if required, obtaining certificates of inspection and approval from inspecting agency and deliver certificates to Engineer and Owner.

1.03. REVIEW OF CONTRACT DOCUMENTS AND SITE

A. With the submission of his bid, Contractor shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractor shall acknowledge that he has examined the Plans, Specifications, and Site, and that from his own investigation he has satisfied himself as to the nature and location of the work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage or materials; availability of labor, water, electric power, roads and uncertainties of weather; the confirmation and condition of the ground; the characters, quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work, especially the prohibited use of Owner's permanent equipment, ductwork, and controls; all federal, state, county, township and municipal laws, ordinances, and regulations particularly those relating to employment of labor, wage rates, and construction methods; and all other matters which can in any way affect the Work or the associated cost of the Work under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work.

C. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

1.04. USE OF THE OWNER'S EXISITNG AND NEW, PERMANENT HVAC SYSTEM DURING CONSTRUCTION

A. Use of the Owner's existing and currently being installed, permanent HVAC system during Construction is prohibited. Provide temporary means for heating and cooling required by construction activities for curing or drying completed installations or for protecting installed construction from adverse effects of temperature and humidity. Provide temporary dehumidification systems when

required to reduce substrate moisture levels required to accommodate installation or application of finishes.

B. Maintain a minimum ambient temperature of 50 DEG. F. in areas where construction is in progress, unless indicated otherwise in the specifications.

C. Prevent dust, fumes, construction debris, and odors from entering existing and newly installed HVAC equipment, ductwork, and control system components. Prior to commencing work, isolate HVAC equipment. Where existing HVAC systems will be affected, isolate existing supply, return, and exhaust ducts by disconnecting ductwork at point where existing duct shall remain. Cover ends of existing ductwork securely with black plastic material.

D. Newly installed ductwork shall be thoroughly cleaned before installation. Each section that is installed at the end of the day shall have open ends securely covered with black plastic material.

E. Newly installed HVAC equipment shall be securely covered and protected with black plastic material or by other approved method. After installation of air moving equipment, duct connections shall be securely covered with black plastic material. Connections to duct systems shall not be made until final finishes have been installed, areas served are clean, and building is ready for HVAC equipment start-up and use.

F. Securely cover control system components to prevent damage from construction debris, dust, and dirt. Control systems shall not be energized for testing and adjusting until HVAC system start-up.

G. HVAC Equipment, Ductwork, and Control Components contaminated by construction debris, dirt, and construction dust shall not be acceptable and shall be replaced at no additional cost to the Owner. HVAC Equipment, Ductwork, and Control components shall be kept clean throughout construction. Cleaning after an HVAC system has been contaminated shall not be an acceptable alternate to replacement.

1.05. SHOP DRAWINGS AND SUBMITTALS

A. Submit manufacturer's catalog sheets and/or shop drawings covering all phases of work included in this Contract.

B. Arrange submittals in sets and bind in PDF format. Loose sheets are not acceptable. Indicate for each item the location, system, or position where it is to be used, arrange by equipment type and tab sections.

1. Individual submittal packages may be made for plumbing, HVAC, fire protection, test and balance, and controls. The Contractor may submit up to 5 different packages, but where practical provide all submittals in a single PDF.

2. Items which are required to be resubmitted shall come in a single PDF. Approved equipment is not required to be resubmitted.

3. The Contractor is responsible for verification that all items are submitted.

C. Submittals shall bear written certification to the effect that the Contractor has examined them and found them to include all items required to be submitted and to be in accordance with specifications.

D. Submittals are required even though equipment being furnished is exactly as specified.

E. Submittals shall include all data required in individual sections of these specifications.

F. Contractor is responsible for making all submittals required by the specifications for approval. If equipment is delivered or installed without an approved submittal, Contractor may be required to remove and replace equipment with specified and approved equipment, as directed by the Engineer, without additional cost to the project.

G. Exceptions for Submittals

1. Exceptions to the Specifications or Drawings shall be clearly defined in a separate section of each submittal package. The submittal shall contain the reason for the exception, the exact nature of the exception and the proposed substitution so that a proper evaluation may be made by the Engineer. The acceptability of any device or methodology submitted as an “or equal” or “exception” to the Specifications shall be at the sole discretion of the Engineer.

2. By noting the term “compliance”, it shall be understood that the Contractor is in full compliance with the item specified and will provide exactly the same with no deviations.

3. By noting the term “deviation”, it shall be understood that the Contractor prefers to provide a different component in lieu of the one specified and in so doing, takes full responsibility for making the equipment work as specified and will provide any and all ancillary components to make the equipment work at no extra cost to the Owner.

4. By noting the term “alternate”, it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner and in so doing, takes full responsibility for making the equipment work as specified and will provide necessary ancillary components to make the equipment work at no extra cost to the Owner. The alternate method shall be fully described with schematic diagrams and one-line diagrams as applicable.

1.06. SUBSTITUTION OF MATERIALS

A. Final decision as to whether or not a specific piece of equipment meets specifications shall rest with Engineer.

B. Substitution requests will not be accepted prior to bid.

C. Equipment and material manufacturers are referenced in the Plans and Specifications to establish the basis of design and required standards.

D. With each Substitution Request, submit technical data that will fully establish the equality of the proposed substitute product with that listed. Submit completed Substitution Request Form.

E. Substitution Process

1. The naming of a manufacturer's product with the words "basis of design" or the naming of a single manufacturer's product on a drawing equipment schedule, on other drawings, or in the specifications, establishes that specific product as the basis for design. In the absence of any other named acceptable manufacturer's product, provide the "basis of design" product. No substitutions will be accepted.

2. Where other manufacturer's names are listed on the drawings or in the specifications as acceptable in addition to the "basis of design" product, product acceptability for these manufacturers shall be verified via submittal review after the project has bid. No other substitutions will be accepted.

3. Where the words "include but shall not be limited to" or "or equal" are used in addition to a manufacturer's name or a list of manufacturer's names, product acceptability for these manufacturers shall be verified via submittal review after the project has bid.

4. It is the responsibility of the Contractor to provide all of the data necessary to establish acceptability of the product.

5. The submittal for the substitution will be reviewed for conformance with the specifications and equality to the specified products. Full submittals will be required of all equipment. Substitution submittals will be reviewed and shall be rejected if the proposed equipment is found to be different than indicated on the Substitution Request Form, or is found deficient compared to scheduled performance/or specifications.

F. Any proposed substitutions of equipment shall be accompanied by product submittal and shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged

connections, such connections shall be installed to the complete satisfaction of Engineer without additional cost to Owner.

G. The Contractor is responsible for full coordination of all changes required by substituted equipment, including dimensional clearance.

H. The Contractor is responsible for all additional costs of equipment installation, coordination and engineering which results from his substitution. This includes all aspects of the work including architectural, structural, civil, electrical, and mechanical. This also includes costs for the redesign time of Architects and Engineers.

I. Costs associated with dimensional, performance, or other deviations from the "basis of design" equipment, including engineering costs to evaluate such deviations, shall be paid by the Contractor. If a product other than the "basis of design" product is submitted and subsequently rejected during the submittal process, Contractor shall provide the "basis of design" product.

J. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall provide the basis of design, or make corrections as directed by Engineer.

1.07. GUARANTY-WARRANTY

A. Guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. Compile and assemble the warranties specified in the mechanical division, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment; date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers, and procedures for filing a claim and obtaining warranty services.

D. All materials and equipment shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections. Longer warranty periods for specific items shall be listed in other sections of these specifications.

PART 2 MATERIAL

2.01. MATERIAL AND EQUIPMENT

A. Equipment shall be new, undamaged, and of the same manufacturer except where indicated otherwise.

B. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

C. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

D. Protect work and equipment at all times from damage, weather, and entrance of dirt and water. Close pipe and duct openings with caps or plugs during installation.

2.02. ELECTRICAL

A. Contractor shall carefully coordinate voltage and amperage requirements of equipment to be provided. Coordinate with Electrical Contractor prior to equipment order. Any change to electrical systems required by Contractor's substitutions or uncoordinated equipment needs shall be made without cost to the project.

B. Provide all electrical interlock, control, and other wiring, not covered specifically under the electrical drawings and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

C. Supervise and coordinate all electrical work in connection with mechanical systems.

D. Furnish all motor controllers and contactors, not furnished as part of a motor control center, or by Electrical Division for proper operation of all motors. Submit motor data with submittals.

2.03. ROOF AND FLASHINGS

A. A. Special care shall be taken on roofs to prevent damage. Promptly repair any damage at no additional expense to the Owner. Comply with bonding requirements of new and existing roofs.

B. B. Flashings are not covered by this section. Refer to Architectural Division.

2.04. ACCESS PANELS

A. Provide access panels in all floors, walls, and plaster and non-lay-in type ceilings as required or as indicated to service devices in piping requiring access, controls, devices in ductwork requiring access, and other system components requiring access for service or regular maintenance. Closely coordinate requirements for

access doors before bidding.

B. Access doors shall be "Milcor" type appropriate for the construction involved.

C. Size and type shall be as required for proper service and/or as may be directed by the Engineer. Minimum size to be 24” x 24”.

2.05. ASBESTOS AND OTHER HAZARDOUS OR TOXIC MATERIALS

A. No Asbestos containing materials shall be used on this project.

B. Contractor is responsible for his own means and methods of safety where Hazardous or Toxic materials are use for the installation of his work. All work shall comply with state and federal regulations.

C. Contractor shall protect the Owner's facility and employees from conditions generated by his work.

D. In the event that a potentially hazardous material is discovered during the course of the work, Contractor shall stop work immediately, and provide for the safety of his employees and other occupants. He shall make proper notifications as required by his contract and by law.

2.06. CONCRETE

A. Concrete materials and installations indicated on the drawings for curbs, pads, and supports for mechanical equipment shall be provided as part of the contract.

B. Comply with other architectural and structural portions of the specifications for materials and methods.

C. Concrete.

1. Concrete shall be commercial grade containing Portland cement, aggregates, clean water, and mix ratios suitable for the loads, and site conditions.

2. Concrete shall be 3,000 psi class indoors and 3,500 psi class outdoors unless noted otherwise.

3. Comply with ACI standards for cold and hot weather applications.

D. Installation

1. Use rigid and smooth forms to prevent visible defects and deflections in the work. Use form compound to prevent concrete bonding to the forms.

2. Provide chamfered corners on the tops of curbs.

3. Reinforce pads and curbs with steel reinforcing bars minimum size number 3, welded wire fabric, or as indicated on the drawings. Set the reinforcing depth within the concrete for optimum strength for the application.

4. Provide equipment pads of sizes indicated and at least large enough to extend past the mechanical equipment 6" on all sides. Minimum height 6” unless otherwise noted.

5. Pour pads integral with the floor slab, isolate from the floor slab, or dowel the pads, as indicated on the drawings.

6. Grout all voids with high strength grout mixture.

7. Installation of the pads shall be coordinated so that the concrete has set and the strength is suitable for installation of the equipment.

8. Set anchor bolts where indicated by either equipment manufacturer or Structural Engineer.

9. Brush-finish equipment pads.

2.07. LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are offered as a general guide only and are not to be assured accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply condition of soil to be encountered.

2.08. EXCAVATION, TRENCHING AND BACKFILLING

A. Excavation, trenching, and backfilling in connection with the mechanical system, to a point 5'-0" outside the building, is included as part of this Division, unless indicated otherwise.

B. Excavation required shall be done as part of the contract price regardless of any implied conditions on the drawings or in these specifications.

C. Excavation to have 12" minimum and 24" maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel, or concrete, as directed by Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone, or clean sand and thoroughly compact. Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to

excavation to prevent water from running into excavation. Remove accumulated water in the excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench shall be 5" minimum, 8" maximum on each side of pipe bell. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8" below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing, and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Engineer, and to conform to governing laws and state and federal regulations. Comply with OSHA Regulations.

F. After piping installation, inspection, testing, and approval by governing agency; backfill trenches with clean, stable soil free from stones. Place backfill in 4" layers, tamped under and around pipe and conduit to height of at least 2' above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8" layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests may be required by the Engineer, with the costs paid by the Contractor.

G. Underground piping shall be marked with metallic marking tape inserted in the trench a minimum of 12" below grade and a minimum of 12" above mains.

H. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless directed otherwise.

2.09. MECHANICAL INSTALLATIONS:

A. Coordinate mechanical equipment and material installation with other building components and other trades. Investigate each space in the structure through which mechanical equipment furnished under these specifications must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. Verify all dimensions by field measurements. By ordering equipment, Contractor assumes responsibility for the installation and orientation of equipment in the available space.

C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of mechanical materials and

equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Fit equipment, pipe, and duct into the available spaces in the building and introduce into the building, at a time, and in a manner, as not to damage the structure. Install ductwork and piping to provide the maximum possible clear height underneath.

G. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

H. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

I. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

J. Coordinate the installation of mechanical materials and equipment above ceilings with suspension systems, light fixtures, and other installations.

K. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

L. Do not support material or equipment of other trades from piping or ductwork.

M. Do not use equipment, piping, or ductwork as scaffolding, scaffolding support, or as other means to access the work. Damaged systems and components shall be repaired or replaced in accordance with the full satisfaction of the Owner and Engineer.

N. Core drill piping penetrations of concrete walls, floors, and other concrete structures.

O. Equipment locations shown on the drawings are approximate. Final locations shall be established and determined in the field to best utilize available space.

P. Replace architectural features removed or damaged during the course of the work.

Q. Maintain fire assembly ratings as dictated by authorities having jurisdiction. Seal around penetrations through UL rated assemblies, fire, and smoke walls.

R. Fully seal around duct or pipe routed through exterior walls.

2.10. EQUIPMENT CONNECTIONS

A. Each equipment item with drain connections shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final required connections to equipment, furnished under other Divisions of the Specifications or by the Owner.

1. Provide necessary labor and materials for a complete installation. Trap and vent drainage connections as required.

2. If equipment or fixtures furnished by others are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are provided to the installer.

D. Extend grease fittings to accessible locations.

2.11. CUTTING AND PATCHING

A. Provide cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction is specified or required for new work.

B. Cutting of structural members will not be permitted except through explicit instructions from the Engineer. Reinforcing will be required where members are cut.

C. Do not endanger or damage installed work through procedures and processes of cutting and patching.

D. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

E. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

F. Perform cutting, fitting, and patching required to:

1. Uncover Work to provide for installation of ill-timed Work.

2. Remove and replace defective Work.

3. Remove and replace Work not confirming to requirements of the Contract Documents.

4. Remove samples of installed Work as specified for testing.

5. Upon written instructions from Engineer, uncover and restore Work to

provide for Engineer observation of concealed Work.

2.12. GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

I. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5,000-psi (34.5-MPa), 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.13. SEISMIC

A. Mechanical systems shall be installed in conformance with the requirements of the state and federal codes and regulations for Seismic considerations, as specified and noted on the drawings.

B. All seismic restraining and snubbing devices shall be manufactured specifically for this duty. Devices constructed by the Contractor will not be accepted.

C. Contractor shall be responsible for the design and installation of the restraining and snubbing systems based on the criteria included on the drawings and in the specifications, and the actual equipment, and locations of installation.

2.14. START UP, TESTING, AND ADJUSTING

A. Contractor shall include adequate time in construction schedule for HVAC system start-up; testing, adjusting, and balancing; and control system installation,

programming, testing, and commissioning.

B. Each and every phase of the plumbing, air conditioning, heating and ventilating systems shall be operated separately, or in conjunction, one with the other, for a sufficient period of time to demonstrate to the entire satisfaction of the Engineer the ability of the systems to meet the capacity and the performance requirements while maintaining design conditions, in accordance with the intent of these specifications.

C. Previous to any performance tests, the Contractor shall have set and adjusted valves, dampers, motors, controllers, thermostats, and other items as are necessary to properly balance phases of the mechanical systems and shall have the systems operating and maintaining design temperatures, humidity, and air circulation throughout all areas of the building.

D. See other sections of these specifications for other possible records and tests to be made.

E. During the first-year warranty, the Contractor may be required to make some or all of the readings above to assure system is functioning properly through the various seasons. Contractor shall make additional adjustments as required.

2.15. PAINTING

A. Provide mechanical equipment with factory painted finish. Where factory finish is damaged during handling and installation, use touch-up paint of same type and color as original paint. Where extensive refinishing of factory applied finishes are required, equipment shall be repainted by the factory.

B. All uninsulated, ferrous equipment, tanks, pipes, fittings, pipe hangers, supports, miscellaneous steel, and ironwork without factory finish shall be primed and painted. Do not paint galvanized hanger rods or galvanized duct straps.

1. Where exposed to view, except in mechanical spaces, color shall be as selected by the Architect.

2. Where located in mechanical spaces or in areas not exposed to view, color shall be as directed by Owner's representative to match Owner's existing color schedule. In the absence of an Owner's color schedule, color shall be black.

C. All insulated mechanical equipment, tanks, and piping not provided with a factory finish shall be painted.

1. Where exposed to view, except in mechanical spaces, color shall be as selected by the Architect.

2. Where located in mechanical spaces or in areas not exposed to view, color shall be as directed by Owner's representative to match Owner's existing color schedule. In the absence of an Owner's color schedule, color shall

be black.

D. For uninsulated material to be painted, prime with one coat of alkyd primer and paint with two coats of alkyd enamel gloss. Paint shall be suitable for the environmental and temperature conditions where material is installed.

E. Paint insulated material with two coats of alkyd enamel gloss. Paint shall be suitable for the environmental and temperature conditions where material is installed.

F. Prepare surfaces for painting in accordance with the paint manufacturer's requirements. Remove or protect portions of the work which are not to be painted.

G. Apply primer coat(s) of paint as recommended by the paint manufacturer.

H. Apply final coat(s) of paint as recommended by the paint manufacturer. Apply paint by brush or roller as dictated by the surface to be painted. Paint should have a smooth appearance without cloudiness, spotting, marks, runs, or other surface imperfections.

I. Clean-up the area of materials, waste, and rubbish. Clean splattered surfaces.

J. Protect the work from damage. Touch-up and restore defaced painted surfaces at the end of the project.

2.16. NOISE: Contractor shall isolate pipes, ductwork, equipment, and other items to insure no additional noise is generated or transmitted to the building when systems are in operation.

2.17. ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment and elevation to support and anchor mechanical materials and equipment. See Paragraph 3.11 for painting.

B. Field Welding: Comply with AWS D1.1.

2.18. OPERATION INSTRUCTIONS

A. Contractor shall provide bound manuals containing complete repair parts' lists, and operating service and maintenance instructions for equipment provided. The manual shall include:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and

troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing and instructions and lubrication charts and schedules.

B. Contractor shall carefully instruct the Owner's operations personnel during the adjustment and testing period of the equipment for such length of time as may be necessary to thoroughly familiarize them with the proper care, operation, and maintenance of the equipment.

C. Contractor shall turn special tools, maintenance items, keys, other devices and materials required to operate or maintain the systems over to the Owner.

2.19. CLEAN UP

A. Do not allow waste material or rubbish to accumulate in or about jobsite. Clean work areas daily.

B. At completion of work, remove rubbish, tools, scaffolding, and surplus materials from and about building, leaving work clean and ready for use without further cleaning required. Clean equipment, piping, valves, fixtures, and fittings of grease, metal cuttings, insulation cement, dust, dirt, paper labels, and other materials that are not part of the final finish.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep mechanical systems clean shall be repaired without cost to Owner.

2.20. NAMEPLATE DATA:

A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Locate nameplates in an accessible location. Where manufacturer’s name plate is not stamped or engraved, provide additional heavy gauge aluminum or brass, stamped or engraved nameplate.

C. Do not remove manufacturer’s nameplates. When manufacturer’s nameplates are to be covered by insulation or other material, provide a separate nameplate for mounting on the exterior of the covering.

2.21. RECORD DOCUMENTS

A. At completion of this project, the Contractor shall provide Engineer with one set of "red lined" design drawings and specification showing all Work installed by him.

B. These documents shall incorporate all changes made in the course of the project

so as to enable the Owner to properly maintain, operate, and repair both exposed and concealed work. The redlines shall indicate changes:

1. Made by Contractor.

2. Addendum Items.

3. Change Orders.

4. Substitutions.

C. Drawings and specifications shall be updated during the progress of the work and kept at the job site.

D. Record Prints: Maintain one set of blue-line or black-line prints of the Contract Drawings, Submittals, and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2.22. FINAL PROJECT OBSERVATION: The final project observation shall not be made until the following items have been assembled and approved as indicated in other sections of the specifications.

A. Certificate of acceptance from local inspecting authorities.

B. Letter of compliance from the Controls Systems Provider indicating that the system is complete, fully operational, and installed as specified by manufacturer’s certified or licensed individuals.

C. Test and Balance report.

D. Owner's Operations and Maintenance manual.

E. Copies of bonds, insurance certificates, waivers, affidavits, warranties and guarantees, and other documents required in the specifications signed and ready for appropriate action.

F. Written notification from the Contractor that the work is complete and ready for final observation and the above documents are completed and available

G. Other documentation which may be required by the Engineer.

2.23. PROJECT CLOSEOUT

A. The final mechanical systems closeout shall not be completed until the Contractor has completed his work and submitted the documents required by Division 1 portions of the specifications. In addition the following work items and specific mechanical documents described in other portions of this specification section shall also be submitted and approved:

1. Record drawings.

2. Record specifications.

3. Guarantee and Warranties.

4. Operating and Maintenance Manuals (O&M). O&M Manuals shall also be provided to the Owner in duplicate. Manuals shall contain approved shop drawings, operations and maintenance instructions, parts manuals for HVAC equipment, an accurate set of design plans showing all construction revisions to the design set, and a copy of the test and balance report.

5. Final clean up.

6. Final Test and Balance Reports with startup logs.

7. Pipe and Equipment Identification.

8. Pipe test certifications.

9. Water treatment analysis and application.

10. Bonds, Insurance Certificates, Waivers, Affidavits, and other documents required in the specifications signed and ready for appropriate action.

11. Other items which may be required by the Engineer.

B. Confirm in writing that specified training specified has been completed with the Owner.

C. Confirm in writing that specified demonstrations have been completed with the Owner.

D. Confirm that test and balance is complete.

END OF SECTION

SECTION 23 0015 - FIRESTOPPING AND SMOKE STOPPING

PART 1 - GENERAL

1.01. SUMMARY

A. Section includes:

1. Through-penetration firestopping in fire rated construction.

B. Scope:

1. The scope of the work shall include the mechanical systems, HVAC piping and ductwork, plumbing piping, fire protection piping, and other systems installed by the contractor.

1.02. 1.02 REFERENCES

A. Underwriters Laboratories

1. U.L. Fire Resistant Directory

a. Through-penetration firestop devices (XHCR)

b. Fire resistance ratings (BXUV)

c. Through-penetration firestop systems (XHEZ)

d. Fill, void, or cavity material (XHHW)

B. American Society for Testing and Materials Standards:

1. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.03. 1.03 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, time rated ceiling/floor assemblies, and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extending through thickness off barrier and used to permanently guard penetration. Sleeves are described as part of

penetrating system in other sections and may or may not be required.

1.04. SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.05. SUBMITTALS

A. Submit in accordance with general conditions unless otherwise indicated.

B. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication

2. Manufacturer's installation instructions.

C. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.

2. Manufacturer or manufacturers’ representative shall provide qualified engineering judgements and drawings relating to non-standard applications as needed.

D. Quality control submittals:

1. Statement of qualifications.

E. Applicators' qualifications statement:

1. List past projects indicating required experience.

1.06. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with

minimum three years documented experience and approved by manufacturer.

1.07. REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.08. ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

D. Furnish forced air ventilation during installation if required by manufacturer.

E. Keep flammable materials away from sparks or flame.

F. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

G. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.09. SEQUENCING

A. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1.10. QUALITY ASSURANCE

A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.11. DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instruction.

1.12. PROJECT CONDITIONS

A. Existing conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

1.13. GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 PRODUCTS

2.01. THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Fire Resistance Director under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved and as further defined in Part 3.06 of this section.

3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

4. Products shall be 3M firestopping products and systems or equal.

2.02. SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-Penetration Smoke-Stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

B. Construction-Gap Smoke-Stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.03. MATERIALS

A. Firestopping Material: Single or multiple component silicone elastomeric rubber type foam compound mixed with incombustible non-asbestos ceramic fibers.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

2.04. 2.04 ACCESSORIE

A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

B. Forming materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02. SURFACE PREPARATION

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion,

or the required fire resistance.

3.03. INSTALLATION

A. Apply primer and materials in accordance with manufacturer's instructions.

B. Install penetration seal materials in accordance with printed instruction of the U.L. Fire Resistance Directory and in accordance with manufacturer's instruction.

C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

D. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Apply firestopping material in sufficient thickness to achieve rating and to a uniform density and texture.

F. Protect materials from damage on surfaces subject to traffic.

G. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

H. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges - installed in accordance with fire damper manufacturer's recommendations.

I. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory.

J. Install smoke stopping as specified for firestopping.

K. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.

L. Dam material to remain.

3.04. FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.05. ADJUSTING AND CLEANING

A. Clean adjacent surfaces of firestopping materials.

B. Clean up spills of liquid components.

C. Neatly cut and trim materials as required.

D. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.06. PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.07. SYSTEMS AND APPLICATION

A. The installation shall be as required by manufacturer for type of construction, Type of U.L. systems, type of penetration, and type of fire stopping system.

END OF SECTION

SECTION 23020

MECHANICAL DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the demolition, removal, relocation, rerouting and reconnection of existing mechanical facilities, as required, shown and specified herein, to accomplish alteration, restoration and to accommodate new construction.

B. The work shall include but not be limited to, draining, disconnecting, relocating, removing and dismantling, in a neat and workmanlike manner, the items and their accessories as indicated or Shown on the Contract Drawings.

1.02 REFERENCES

A. ANSI A10.6 – Safety Requirements for Demolition

B. National Association of Demolition Contractors (NADC) – Demolition Safety Manual

C. NFPA 51B – Cutting and Welding Processes

D. NFPA 70 – National Electrical Code

E. NFPA 241 – Safeguarding Building Construction and Demolition Operations

F. OSHA 29 CRF 1910 – Occupational Safety and Health Standards

G. US EPA – Clean Air Act Amendment of 1990.

1.03 SUBMITTALS

A. Demolition Schedule

B. Fire Watch Procedures

C. Inspection Report of Underground Piping Systems

D. Welding/Burning Permit – Obtain a welding/burning permit from the local Fire Official prior to the start of any welding or burning in accordance with the local Fire Code or as required by the Owner.

1.04 QUALITY ASSURANCE

A. Cutting, patching and removal shall be performed by workers skilled in the specific trades involved.

B. Job Conditions: Prior to start of work, make an inspection accompanied by the Engineer to determine physical condition of adjacent construction that is to remain.

1.05 SPECIAL PRECAUTIONS

A. Torch cutting of ductwork will not be permitted.

B. Torch cutting of other mechanical equipment will be permitted only as indicated by the Engineer.

C. Any cutting method, which may create sparks, must include “Fire Watch” as required by the Fire Code and/or Owner’s Fire Insurance Carrier. Submit fire watch procedures for approval.

D. Draining operations must not damage building components.

PART 2 - PRODUCTS

2.01 Adequately sized rubbish containers for the proper and safe disposal of all debris.

PART 3 - EXECUTION

3.01 PREPARATION

A. Construct temporary partitions prior to any demolition work enclosing respective work. Erect temporary fencing and signage around demolished materials. Use water sprinkling and other suitable methods to limit dust and dirt arising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Protect existing materials and equipment which are not to be demolished.

C. Prevent movement of structure; provide required bracing and shoring.

D. Do not begin the work until the time schedules and manner of operations have been approved by the Engineer and Owner. All interruptions of existing services shall be included in the schedules as approved by the Engineer and Owner.

3.02 GENERAL

A. Provide alteration and demolition of mechanical facilities as required by the contract drawings and specifications. The drawings are diagrammatic and do not show the exact location of all existing mechanical work. Where existing equipment shall remain in service during construction, provide rerouting and reconnection of mechanical services as required to maintain continuous service.

B. Review all equipment with the Engineer and Owner prior to disposal. Existing ductwork, piping, conduit and similar items to be abandoned that are not embedded in walls or floor slabs shall be completely removed unless otherwise shown on the drawings. Cap open ends at all walls and floors.

C. Remove, store and protect all equipment or materials to be reused by the Owner as shown on the drawings. Coordinate exact location of storage with the Owner. Items indicated to be removed, and not designated for Owner's salvage or for reuse, may be salvaged by Contractor. Transport salvaged items that are not to be reused from site as they are removed. Storage or sale of removed items on site will not be permitted.

D. Temporarily cap ends of ductwork to avoid entry of dirt, debris, or discharge of foul odors and gases.

E. Where existing louvers or ductwork penetrations are to remain, blank-off the louver on

the inside with galvanized sheet metal on both sides of 2-inch thick, 6 pcf density rigid fiberglass board insulation. Paint side attached to the louver with flat black paint.

F. Do not close or obstruct egress width to exits. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walkways, occupied areas, and other adjacent occupied or used facilities. Ensure safe passage of persons around or through area of demolition operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

G. Do not disable or disrupt building fire or life safety systems without five (5) days' prior written notice to the Engineer and Owner.

H. Conform to procedures applicable when discovering hazardous or contaminated materials.

I. Conduct demolition to minimize interference with adjacent building structures or Owner's operations.

J. Cease operations immediately if structure appears to be in danger or hazardous materials are encountered. Notify Architect/Engineer. Do not resume operations until directed.

K. Demolish in an orderly and careful manner. Do not cut or remove more than is necessary to accommodate the new construction or alteration.

L. Remove demolished materials from site daily. Do not burn or bury materials on site. Dispose of all material at an approved disposal facility.

M. Cover and protect floors, furniture, equipment and fixtures to avoid soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed. Protect finished surfaces at all times and repair or replace, if damaged, to match existing construction to the satisfaction of the Engineer.

N. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

O. Protect new and existing roofs from damage.

P. Do not interrupt existing utilities serving occupied portions of the facility, except when authorized in writing by Owner's representative. Provide temporary services during interruptions to existing utilities, as acceptable to the Owner. Contractor shall disconnect and seal only utilities to be demolished serving areas being demolished, prior to start of demolition work. If Contractor is required to disconnect utility services or other services to an occupied area, the Contractor shall provide temporary or alternative service to that area, as acceptable to the Owner.

3.03 PIPING REMOVAL

A. Cut off all welded piping square at the locations indicated on the drawings. No cutting will be required where the demolition ends at a flanged valve or equipment. Close off all openings of any remaining valves, piping or fittings with weld caps or blind flanges to prevent debris from entering the existing system.

B. Disconnect all threaded piping at the location indicated on the drawings. Close off all

openings of remaining valves, piping, fittings and equipment with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.

C. Remove all pipe hangers, supports, miscellaneous steel and anchors with the piping.

3.04 PROTECTION FROM FREEZING

A. It is intended that the building remain protected from damage due to freezing temperatures. To that end, existing equipment and systems used for heating shall remain in place and in operation until scheduling permits shutdown.

B. Where the removal of equipment and/or existing systems will leave an area unprotected from freezing, notify the Owner and Engineer at least 72 hours in advance prior to removal so appropriate steps can be taken by the Owner to protect the area. Provide temporary heating equipment sufficient to prevent freezing.

C. It is the Contractor's responsibility to ensure that piping systems that are being worked on are completely drained from water prior to the start of demolition. If water is not drained and the piping freezes it is the Contractor's responsibility to replace piping at his own expense.

3.05 DISCONNECTION AND INTERRUPTION OF MECHANICAL SERVICES

A. When portions of an existing piping system or ductwork system are removed, and this removal causes loss of operation to another piece of equipment due to open (disconnected) piping or ductwork, then cap piping or ductwork or provide temporary piping or ductwork system to retain operation of various systems.

3.06 MECHANICAL EQUIPMENT REMOVAL

A. Remove all mechanical equipment as shown on the Contract Drawings. Remove all electrical work, including wiring between equipment, and wiring to power source or point of origin.

B. Where equipment is supported by steel and/or structural supports, remove these supports.

3.07 REFRIGERANT REMOVAL

A. Recover and dispose of all existing refrigerant charges in accordance with EPA regulations. Release of chlorofluorocarbon refrigerants to atmosphere is prohibited per the Clean Air Act Amendments of 1990.

3.08 DUCTWORK REMOVAL

A. Disconnect all ductwork, which must be removed, at the closest joint and resupport the remaining ductwork.

B. Prepare all remaining ductwork joints at the point of disconnection to receive new ducts or blank-off panels.

C. Remove all ductwork supports and miscellaneous steel with ductwork to be demolished.

3.09 INSULATION REMOVAL

A. Remove insulation, together with all piping, fittings, valves and equipment designated for demolition.

3.10 CONTROL WIRING REMOVAL

A. Disconnect and remove all control wiring and tubing, including conduit, for the Automatic Temperature Control (ATC) System associated with equipment to be removed.

END OF SECTION

SECTION 23 00 30 - ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the basic requirements for electrical components which are to be provided for operation of mechanical equipment. These components include, but are not limited to, motors, starters, and disconnect switches when indicated, furnished as an integral part of packaged mechanical equipment, or furnished separately for mechanical equipment.

B. Furnish all motor controllers and contactors, not furnished as part of a motor control center, for proper operation of all motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections and scheduled on the drawings.

1.02 REFERENCES:

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. National Electric Code (NFPA 70).

1.03 SUBMITTALS:

A. Separate submittal is not required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.04 QUALITY ASSURANCE:

A. Electrical components and materials shall be UL labeled.

B. The electrical work shall comply with the National Electric Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Equipment shall be by same manufacturer, except those items furnished by an equipment manufacturer as an integral part of his equipment. Where possible the equipment shall be by the same manufacturer specified in Division 16.

2.02 MOTORS: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

A. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

B. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. 2-speed motors shall have 2 separate windings on poly-phase motors.

D. Temperature Rating: Rated for 40 degrees C. environment with maximum 90 degree C rise for continuous duty at full load (Class B insulation).

E. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly spaced starts per hour for manually controlled motors.

F. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

G. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

1. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.

2. Bearings:

a. Ball or roller bearings with inner and outer shaft seals.

b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.

c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

3. Enclosure Type:

a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.

b. Guarded drip-proof motors where exposed to contact by employees or building occupants.

c. Weather protected Type I for outdoor use, Type II where not housed.

4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

5. Noise Rating: "Quiet".

6. Efficiency:

a. Motor shall comply with the efficiency requirements of the Energy Independence and Security Act of 2007.

b. Motors smaller than 1 HP shall have minimum full load efficiencies levels per NEMA Standards.

c. Motors 1 HP and larger shall be premium efficiency.

7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.03 STARTERS, ELECTRICAL DEVICES, AND WIRING:

A. Motor Starter Characteristics:

1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R or NEMA 12 with conduit hubs installed by contractor, or units in hazardous locations which shall have NEC proper class and division.

2. Type and size of starter shall conform to adopted standards and recommended practices of the National Electric Code and Underwriters' Laboratories.

B. Manual Switches: Manual switches shall have:

1. Pilot lights and extra positions for multi-speed motors.

2. Overload protection: Melting alloy type thermal overload relays.

3. Manual starters / switches are to be used on fractional horsepower motors only.

C. Magnetic Starters:

1. Momentary contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

2. Trip-free thermal overload relays, each phase.

3. Interlocks, witches and similar devices as required for coordination with control requirements of controls sections.

4. Built-in 120 volt control circuit transformer, with 2 primary and one secondary fuse, where service exceeds 240 volts. Fuses sized to carry holding coil circuit and other connected devices.

5. Externally operated manual reset.

6. Under-voltage release or protection (3-wire control).

7. Branch circuit protection shall meet type 2 coordination protection.

8. A hand-off-auto selector switch shall be provided in addition to start-stop buttons for all devices being controlled automatically.

9. Phase loss relay.

a. Provide protective relays with DPDT 600V rated contacts, locking potentiometer undervoltage adjustment, and LED indicating light at each starter for motors greater than 5 HP. Equal to Square D Class 8430, Type MPD, mounted in suitable enclosure.

D. Motor Connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Heater Contactors:

1. Contactors for resistance heat shall be by same manufacturer as starters unless furnished with heaters. Contactors shall be of the magnetic type and mounted in NEMA Type 1 general purpose enclosure. Contactors shall carry a UL listing and shall be rated for 100,000 cycles.

F. Disconnect Switches:

1. Fusible Switches: Fused, each phase; heavy duty; horsepower rated; non-teasible, quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "open" position; arc quenchers; capacity and characteristics as indicated.

2. Non-fusible Switches: For equipment less than 1 horsepower, switches shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment 1 horsepower and larger, switches shall be the same as fusible type.

2.04 CAPACITORS:

A. Features:

1. Individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnant, craft tissue insulation, and aluminum foil electrodes.

2. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower and larger that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

3.01 GENERAL

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 hp and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Deliver starters and wiring devices which have not been factory-installed on equipment unit to electrical installer for installation.

C. Install starters and wiring devices at locations indicated, securely supported and anchored, and in accordance with manufacturer's installation instructions. Locate for proper operation access, including visibility, and for safety. Do not cover equipment data or informational tags when device is to be mounted on equipment.

D. Install control connections for motors to comply with NEC and applicable provisions of Electrical. Install equipment grounding except where non-grounded isolation of motor is indicated.

E. Connect protective relays to line side lugs of the motor starter and wire control contacts into motor starter circuit.

F. Label starters with engraved plastic nameplate describing the equipment served, e.g., "A.C. Unit No. 1". Nameplates shall be U.V. stabilized for use indoor / outdoor. Attach nameplates with clear silicone sealant.

END OF SECTION

SECTION 23 0060

BASIC PIPING

PART 1 - GENERAL

1.01. THERMAL EXPANSION:

A. Swing joints, turns, expansion loops, and long offsets shall be provided where necessary to allow for expansion and contraction. Pipe, fittings, or equipment damaged during the warranty period due to thermal expansion shall be replaced at no additional cost to the Owner.

1.02. NOISE CONTROL:

A. Piping shall be free of any objectionable self-generated noise. Isolate piping from building where required to prevent transmission of noise.

1.03. CROSS CONNECTIONS:

A. No piping shall be installed that will provide a cross-connection between potable water system and a polluted supply.

1.04. SUBMITTALS

A. Product Data: Submit catalog cut sheets and specifications for each type of pipe, tube, and fitting. Submit pipe schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.

1.05. DELIVERY, STORAGE, AND HANDLING

A. Except for hub and spigot, clay, and similar piping, provide factory applied end caps on all pipe and tubing to prevent damage, and dirt and moisture entry. Maintain end caps through shipping, storage, and handling.

B. Where possible, store pipe, tube, flanges, and fittings inside and protected from the weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.

1.06. QUALITY ASSURANCE

A. Qualify and certify welding and brazing procedures, equipment, and operators in accordance with ASME codes and standards for shop and job site work.

B. Welder's Qualifications: All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

C. Welding procedures and testing shall comply with ANSI Standard B31.1.

D. Soldering and brazing procedures and testing shall comply with ANSI Standard B31.9. Comply with ANSI Standard B31.5 for refrigerant piping.

PART 2 - PRODUCTS

2.01. MATERIALS:

A. Refer to specific piping specification sections for materials to be used on the various piping systems.

B. Materials shall be manufactured by firms whose products of types and sizes required for this project have been in satisfactory use in similar service for 5 years.

C. All materials shall be new and undamaged.

D. For corrosive environments all bare copper piping shall be provided with special Heresite coating even if located within outdoor equipment.

2.02. CONDENSATE, CONDENSING FURNACE, EXHAUST, AND INTAKE PIPE: Sch 40 PVC

A. Condensate exhaust pipe should be sloped back to furnace.

2.03. REFRIGERANT PIPE, INCLUDING LIQUID AND HOT GAS LINES: hard drawn copper, Type "L" (degreased).

A. Soft copper will be permitted when sleeving below grade or installing in wall to eliminate fittings. Soft copper may also be installed on units less than 1 1/2 tons.

B. Do not run refrigerant lines thru return air plenum unless approved by engineer.

C. Do not run refrigerant piping underground.

2.04. JOINING MATERIALS:

A. Refer to specific piping specification sections for special joining materials not list below.

B. Pipe Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8 inch maximum thickness, unless other thickness or specific material is indicated.

2. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

3. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

4. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: approximately 95 percent tin and 5 percent silver, with 0.1 percent lead content.

2. 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.1 percent maximum lead content.

3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.1 percent maximum lead content.

4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.1 percent maximum lead content.

5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.2 percent maximum lead content.

E. Brazing Filler Metals:

1. BcuP Series: Copper-phosphorus alloys.

2. Bag1: Silver Alloy.

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. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. 1. ABS Piping: ASTM D 2235.

2. 2. CPVC Piping: ASTM F 493.

3. 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

4. 4. PVC to ABS Piping Transition: ASTM D 3138.

H. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

I. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

J. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 536 ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel Paint.

K. Dielectric Fittings

1. 1. Provide dielectric connection at all connections between pipe materials of differing types whether indicated on plans or not.

2. 2. Insulating Material: Suitable for system fluid, pressure, and temperature.

3. 3. Dielectric Unions: Factory fabricated, union assembly, for 250-psig minimum working pressure at 180 °F.

4. 4. Dielectric flanges: Factory fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

5. 5. Dielectric-Flange Insulation Kits: Field assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.

6. 6. Dielectric couplings: Galvanized steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends, and 300-psig minimum working pressure at 225°F,

7. 7. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; threaded ends, and 300-psig minimum working pressure at 225°F.

2.05. PIPE ESCUTCHEONS:

A. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to

completely cover pipe penetration hole in floor, walls, or ceilings; and pipe sleeve extension, if any. Furnish solid pipe escutcheons with nickel or chrome finish for occupied areas. Prime paint finish for unoccupied areas. Split hinge type is not acceptable in occupied areas, except on existing piping.

B. For waterproof floors and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons.

2.06. PIPE SLEEVES:

A. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" diameter and smaller, 20 gauge; 4" to 6" diameter, 16 gauge; over 6" diameter, 14 gauge.

B. Steel-Pipe: Fabricate from ASTM A 53, Grade A, Schedule 40 galvanized steel pipe.

C. Iron-Pipe: Fabricate from cast-iron or ductile iron pipe; cast-iron sleeve to be same wall thickness as equivalent ductile iron pipe.

2.07. SLEEVE SEALS:

A. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing water tight seal and electrical insulation. Thunderline, "Link Seal" or equal.

B. Fire Protection Mechanical Sleeve Seals: Three (3) hour rated modular mechanical type, consisting of interlocking fire resistant silicone rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing water tight seal and fire resistant seal. Thunderline, "Link Seal" or equal.

C. Fire Protection Sealant

1. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies and provide a fire rating equal to that of construction being penetrated.

2. All firestop materials and methods shall conform to applicable governing codes having local jurisdiction, whether approved by submittal or not.

3. For those firestop applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgment derived from similar independently tested system designs will

be submitted to local authorities having jurisdiction for their review and approval prior to installation.

D. Elastomeric Joint Sealant: Type S, Grade NS, Class 25, Use O, neutral-curing, silicone sealant unless otherwise indicated.

E. Grout: Nonshrink, nonmetallic, hydraulic cement grout, ASTM C 1107, Grade B. Post hardening, volume adjusting, dry, nonstaining, noncorrosive, and nongaseous recommended for interior and exterior applications. 5000 psig, 28 day strength.

PART 3 - EXECUTION

3.01. GENERAL:

A. Install piping as described below, unless indicated otherwise in the individual piping sections. See the individual piping sections for unique piping installation requirements.

B. Exposed lines are to be run parallel with, or perpendicular to, building lines and wherever possible shall be grouped together for easy service and identification. Lines requiring a definite grade for drainage shall have precedence in routing over all other lines. Wherever possible, horizontal and vertical lines shall be held as close as possible to walls, ceilings, struts, and structural members to occupy minimum space consistent with the proper requirements for insulation, expansion, removal of pipe, and access to valves. Except in mechanical spaces, piping shall not be run exposed in finished area of buildings unless otherwise noted.

C. General Locations and Arrangements: Drawings including plans, schematics, and diagrams indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

D. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

E. Install fittings for changes in direction and branch connections.

F. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, and below grade or floors, unless indicated otherwise.

G. Install piping at indicated slopes and as prescribed by Code.

H. Install components with pressure rating equal to or greater than system operating pressure.

I. Install piping free of sags and bends.

J. Install piping with sufficient space above removable ceiling panels to allow for panel removal.

K. Install drains at low points in mains, risers, and branch lines consisting of a branch fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.

L. Piping shall be worked into place without springing and/or forcing. Arrange piping so that it does not interfere with removal of other equipment or devices, nor to block access to doors, windows, manholes, or other access openings.

M. All piping shall be installed so as to avoid liquid or air pockets throughout the work. Piping shall be erected and pitched to insure proper draining. Provide air vents and drain traps where indicated and as required.

N. All exposed plumbing fixture supplies and stops shall be chrome-plated.

O. Do not run piping through electrical or electronic equipment spaces and enclosures unless unavoidable. If piping must be run through electrical spaces, comply with NFPA 70 for access clearance requirements for electrical equipment. Install drip pan under piping which must be run through electrical spaces. Pan drain shall be run at exterior or sanitary, as permitted by Code.

P. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6" shall be steel; pipe sleeves 6" and larger shall be sheet metal.

Q. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained.

3.02. ASSEMBLY:

A. All pipes shall be cut square and shall have burr and cutting slag removed by reaming or other cleaning methods.

B. Remove scale, slag, dirt, and debris from both inside and outside of piping and fittings before assembly.

C. Unions or flanges shall be used at all equipment connections to facilitate dismantling.

D. All joints and changes of direction shall be made with standard fittings. Reducers shall be used at pipe size changes.

E. Where required to prevent electrolysis and corrosion, dielectric fittings and couplings, or brass or bronze fittings or valves, shall be used between copper and steel piping. Provide insulating coupling on all underground metallic utility lines where they connect to building.

F. Nipples shall be of same material and composition as pipe on which they are installed, and shall be extra heavy when unthreaded shoulder is less than 1-1/2". No running thread nipples will be permitted. Minimum exposed shoulder of any nipple shall not be less than 3/4".

G. Joints between steel or copper pipe and cast iron shall be made with caulking ferrules.

H. Cast iron soil pipe and fittings shall be assembled with approved molded push-on type gaskets. Approved no-hub pipe may be used where applicable.

I. Galvanized steel pipe shall be assembled with galvanized screwed fittings.

J. Black steel pipe shall be assembled with screwed or welded fittings.

K. Copper pipe shall be assembled with wrought copper fittings. Use Alloy Sn95 (95/5) solder as a minimum. See specific piping sections for other requirements.

L. For steel piping, use new forged tees for branch connections to main in new piping systems. Forged tees or forged weld-o-lets shall be used for branch connections to existing mains.

M. Soldered Joints: Construct joints according to AWS's "Soldering Manual"; or CDA's "Copper Tube Handbook".

N. Brazed Joints: Construct joints according to AWS's "Brazing Handbook".

O. 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. Use appropriate tape or thread compound as required unless dry threading is specified.

P. Welded Joints: Construct joints according to AWS D10.12 using qualified processes and welding operators.

Q. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

R. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe handling practice of cleaners, primers, and solvent cements.

2. ABS Piping: ASTM D 2235 and ASTM D 2661.

3. CPVC Piping: ASTM D 2846 and ASTM F 493.

4. PVC Pressure Piping: ASTM D 2672.

5. PVC Nonpressure Piping: ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

3.03. FITTINGS AND ACCESSORIES:

A. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, and elsewhere as indicated.

B. Install unions adjacent to each valve at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

C. Install flanges in piping 2-1/2" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.

D. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through walls, partitions, and ceilings where penetration is exposed to view; and on the exterior of the building.

3.04. SUPPORTS:

A. Provide an adequate pipe suspension system in accordance with recognized engineering practices, using, where possible, standard, commercially accepted pipe hangers and accessories. No piping shall be supported by, or from, hangers supporting electrical conduit.

3.05. SLEEVES

A. Install pipe sleeves of types indicated where piping passes through walls, floors, slabs, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as directed by the Structural Engineer.

B. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two (2) pipe sizes larger than piping run. Where insulation includes vapor barrier jacket, provide sleeve with sufficient clearance for insulation.

C. Install length of sleeve equal to the thickness of construction penetrated, and finished flush to surface; except extend floor sleeves 1 inch above level floor finish.

D. Sleeves are not required for core-drilled holes.

E. Permanent sleeves are not required for holes formed by removable plastic sleeves.

F. Provide temporary support of sleeves during placement of concrete and other work around sleeves. Provide temporary closure to prevent concrete and other materials from entering sleeves.

G. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings for pipe diameter including insulation (if any) of 6 inches and larger.

H. Install iron-pipe sleeves at exterior penetrations, both above and below grade and for slab on grade penetrations.

I. Install steel-pipe sleeves at interior partitions for pipe diameter including insulation (if any) of less than 6 inches.

J. Seal voids between outside of sleeve and construction with nonshrink, nonmetallic grout.

K. Sleeves Seals:

1. Provide sleeve seals for core drilled holes and holes made using removable plastic sleeves.

2. Provide mechanical sleeve seals for exterior wall, floor, and slab on grade applications. Install in accordance with manufacturer's recommendations for a water tight seal. Except for slab on grade and below grade wall penetrations, elastomeric joint sealants may be used in lieu of mechanical sleeve seals.

3. Provide fire mechanical sleeves seals for penetrations of rated walls, slabs, floors, and ceilings. Fire protection sealants complying with all authorities having jurisdiction may be used in lieu of mechanical type seals.

4. Sleeve seals are not required in non-rated interior partitions and ceilings.

3.06. CLEANING, FLUSHING, INSPECTION:

A. Clean exterior surfaces of installed piping systems and prepare for application of coating and painting (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each length for completion, supports, and accessories.

3.07. TESTING:

A. Test all piping systems as hereinafter specified and furnish to the Engineer copies of the test reports signed by the Contractor.

B. Piping located underground shall be tested and inspected by the governing agency before backfilling.

C. Equipment and personnel required for tests shall be furnished without additional cost. Testing equipment shall be as required for particular test, with all equipment and gauges accurate and in good working order.

D. Equipment subject to damage at given test pressure shall be removed from line before pressure is applied. Use proper plugs or caps.

E. Repair piping system sections which fail the required test, by disassembly and re-installation, using new materials. Do not use chemicals, stop-leak, mastics, or other temporary repair methods. Retest the system.

F. Drain test water after testing and repair work has been completed.

G. See specific piping system sections for test pressure, duration and medium.

H. Comply with ANSI Standard B31.1.

END OF SECTION 23 0060

SECTION 230075

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following mechanical identification applications:

1. Equipment identification.

2. Pipe identification.

3. Valve tags.

4. Valve schedule.

5. Duct identification.

1.02 SUBMITTALS

A. Product Data: For each type of product proposed.

B. Product Schedule: Provide schedule indicating each type of identification material to be used for equipment, piping, and ductwork. Indicate colors to be used.

C. Valve and Steam Trap Schedule: Submit a valve and steam trap schedule for each piping system, typewritten and reproduced on 8-1/2” x 11” bond paper. Provide three (3) copies. Mark valves which are intended for emergency shut-off, normally open, normally closed, and similar special uses by special flag in the margin of the schedule. Include the following for each valve:

1. Valve identification number.

2. System.

3. Purpose.

4. Location.

5. Type.

6. Size.

7. Manufacturer.

1.03 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, “Scheme for the Identification of Piping Systems”, for letter size, length of color field, for colors not included in the schedule herein, and for viewing angles of identification devices for piping.

1.04 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

A. Engraved Plastic Laminate Identification Signs

1. General: Provide engraving stock melamine plastic laminate in the sizes and thicknesses indicated, with engraver's standard letter style, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where using adhesive mounting.

2. Thickness: 1/16" for units up to 20 inches square or 8" length; 1/8" for larger units.

3. Fasteners: Self tapping stainless steel screws except use contact-type, permanent adhesive where screws cannot or should not penetrate the substrate. Where sign cannot be attached directly to device or equipment, attach with brass chain.

4. Letter sizes: Minimum ¼ inch for names of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of the principal lettering.

2.02 DUCT IDENTIFICATION

A. Engraved Plastic Laminate Identification Signs

1. General: Provide engraving stock melamine plastic laminate in the sizes and thicknesses indicated, with engraver's standard letter style, colored black background with white letters except as otherwise indicated.

2. Thickness: 1/16" for units up to 20 inches square or 8" length; 1/8" for larger units.

3. Fasteners: Contact-type, permanent adhesive.

4. Letter sizes: Minimum ¼ inch for names of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of the principal lettering.

B. Stencils: As specified and indicated herein.

2.03 STENCILS:

A. Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4" for ducts; and minimum letter height of ¾" for equipment and access door signs.

B. Use alkyd paint.

C. Use stencils only as directed herein.

PART 3 - EXECUTION

3.01 EQUIPMENT IDENTIFICATION

A. Provide permanent, factory, operational data, nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location. Where manufacturer's nameplate is not stamped or engraved, provide additional heavy gauge, aluminum or brass, stamped or engraved nameplate. Do not remove manufacturer's nameplates. When manufacturer's nameplates are to be covered by insulation or other material, provide a separate nameplate for mounting on the exterior of the covering.

B. In addition to factory nameplate, provide an engraved plastic laminate (stenciled) identification sign for each major item of mechanical equipment and each operational device. Provide identification signs for the following general categories of equipment.

1. Main control and operating valves, including safety devices and hazardous units such as gas outlets or steam relief valves.

2. Chillers, cooling towers, condensing units, compressors, pumps, and similar motor-driven units.

3. Heat exchangers, coils, and similar equipment.

4. Fans and blowers.

5. Packaged and central-station type air units.

6. Tanks and pressure vessels.

7. Strainers, filters, humidifiers, water treatment systems, and similar equipment.

8. 8. Control panels.

9. Fuel burning units, such as boilers, furnaces, and heaters.

10. Fire department hose valves and hose stations.

C. Provide engraved sign at each access door, indicating equipment or device to be accessed.

D. Coordinate names, abbreviations, and other designations used in equipment identification with corresponding designations shown, specified, scheduled, or as designated by the Owner's representative. Provide numbers, lettering, and wording as indicated or as directed by the Owner's representative. Owner shall set priority for lettering and graphics. Where multiple systems of the same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, AHU-1H, Standpipe G14).

3.02 PIPE IDENTIFICATION

A. Provide 1" thick molded fiberglass insulation with jacket under each plastic pipe marker to be installed on uninsulated pipes where fluid temperatures will be 125°F or greater. Insulation shall extend 4" beyond edges of marker.

B. Valve tags and steam traps shall be numbered as indicated on the valve listing provided to the Owner.

C. As a minimum, identification shall be applied to piping at the following locations:

1. Adjacent to each valve.

2. At each branch and riser take-off.

3. At each pipe passage through wall, floor, and ceiling construction.

4. At each pipe passage to underground.

5. At not more than forty feet spacing on straight pipe runs.

D. Place identification so it can be easily read. Arrows shall be applied to indicate direction of flow.

E. Underground Piping: During back-filling of each exterior underground piping system, install plastic line marker, located directly over buried line no deeper than 8” below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16”, install a single line marker.

3.03 DUCTWORK IDENTIFICATION

A. Identify ductwork using stenciled signs. Letter color for stenciled signs shall be either white or black. Provide the color that produces the most contrast with the covering being stenciled. Indicate direction of flow, air handling unit or fan, air terminal box, and duct service (such as supply, return, and exhaust).

B. Apply ductwork identification at the following locations:

1. Adjacent to each damper.

2. At each passage through walls, floors, or ceiling construction.

3. At no more than forty feet intervals.

4. At air handling units, fans, and air terminal boxes

END OF SECTION

SECTION 23 0086

PIPING INSULATION

PART 1 - GENERAL

1.01. SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets, and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Insulation of Underground Piping is specified elsewhere and not work of this Section.

1.02. REFERENCE STANDARDS

C. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

D. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

E. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.

4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

9. ASTM C547 - Mineral Fiber Pipe Insulation.

10. ASTM C552 - Cellular Glass Thermal Insulation.

11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

14. ASTM C450 - Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

15. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.

16. ASTM C921 - Jackets for Thermal Insulation.

17. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

18. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

19. ASTM D1667 - Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed-Cell).

20. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

21. ASTM C795 - Insulation For Use Over Austenitic Steel.

22. ASTM E84 - Surface Burning Characteristics of Building Materials.

23. ASTM E96 - Water Vapor Transmission of Materials.

24. NFPA 255 - Surface Burning Characteristics of Building Materials.

25. UL 723 - Surface Burning Characteristics of Building Materials.

26. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.03. DEFINITIONS

F. Concealed: Areas that cannot be seen by the building occupants.

G. Interior Exposed: Areas that are exposed to view by the building occupants, including underneath countertops, inside cabinets and closets, and all equipment rooms.

H. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.

I. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

J. Unconditioned Space: Interior space that is not temperature-controlled by cooling and/or heating system. Includes attics, chases, unconditioned living spaces and non-conditioned equipment rooms.

1.04. QUALITY ASSURANCE

K. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

L. All insulation, jacket, adhesives, mastics, sealers, and accessories utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.

1. Certificates to this effect shall be submitted along with submittal data.

2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

M. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years experience specializing in the trade.

N. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

O. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

P. Stainless Steel: Insulation applied on stainless steel shall meet requirements of ASTM C795 and NRC 1.36. These requirements are for prevention of external stress Corrosion Cracking (ESCC) for austenitic stainless steel.

1.05. SUBMITTALS

Q. Prepare a schedule of piping insulation showing systems insulated. For each system, show insulation type, thickness, temperature rating, and special conditions where applicable.

R. Submit product data for each piping system. Product data shall include but not be limited to the following:

1. Manufacturer's name

2. Insulation material and thickness

3. Jacket

4. Adhesives

5. Fastening methods

6. Fitting materials

7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)

9. Other appropriate data

S. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.

T. Operation and Maintenance Data: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.06. DELIVERY, STORAGE AND HANDLING

U. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer’s identification including product thermal ratings and thickness.

V. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

W. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01. 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.

2.02. MANUFACTURERS

B. Insulation:

1. Owens-Corning

2. Certainteed Corporation

3. Johns Manville Corporation

4. Knauf Corporation

5. Armstrong/Armacell (Armaflex)

6. RBX Industries/Rubatex

7. FOAMGLAS (Cellular Glass) by Pittsburgh Corning

C. Jackets:

1. Childers Products Company

2. PABCO

3. RPR Products, Inc.

4. John Mansfield Speedline

5. Foamglas

D. Coatings, Sealants, and Adhesives:

1. Foster

2. Childers

2.03. INSULATION MATERIALS

E. Products shall not contain asbestos, lead, mercury, or mercury compounds.

F. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

G. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

H. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

I. Piping Insulation Type P1: Glass-Fiber, Preformed Pipe Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A with factory applied ASJ-SSL vapor barrier jacket with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I. Provide one of the following:

1. Owens Corning; Evolution Fiberglas Pipe Insulation.

2. Johns Manville; Micro-Lok Pipe Insulation.

3. Knauf; Earthwool 1000 degree Pipe Insulation.

J. Piping Insulation Type P2: Flexible Elastomeric Pipe Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Provide one of the following:

1. Armacell LLC; AP Armaflex

2. Aeroflex USA Inc; Aerocel

3. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

K. Piping Insulation Type P3: Handicap Lavatory and Sink Piping Insulation Kit:

1. Handicap lavatory and sink drain piping, P-trap, cold and hot water assemblies and valves shall be insulated with fully molded insulation kit specifically designed for handicap lavatories and sinks. ADA conforming.

2. Material shall be 3/16" thick molded closed cell vinyl with nylon fasteners, white finish and be self-extinguishing per ASTM D635, with K value of 1.17 BTU/in./hr./sq. ft./deg. F.

L. Piping Insulation Type P4: Preformed Cellular Glass: Comply with ASTM C 585, ASTM C 450. Provide one of the following:

1. Pittsburgh Corning; Foamglas

2.04. FIELD-APPLIED FABRIC-REINFORCING MESH

M. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe. Provide one of the following:

1. Foster Brand, Specialty Construction Brands, Inc; Mast-A-Fab.

2. Vimasco Corporation; Elastafab 894.

2.05. FIELD-APPLIED JACKETS

N. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

O. Piping Jacket Type J1: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; 40 mil thickness, roll stock ready for shop or field cutting and forming. Provide factory-fabricated fitting covers to match jacket. Provide one of the following

1. Johns Manville; Zeston.

2. Proto Corporation; LoSmoke

P. Piping Jacket Type J2: Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14. Provide factory-fabricated fitting covers or field fabricate covers only if factory-fabricated fitting covers are not available. Provide one of the following:

1. Provide Childers Brand Metal Jacketing Systems.

2. Provide shop fabricated smooth aluminum jacket 0.016".

2.06. TAPES

Q. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

R. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.

2. Thickness: 6 mils.

3. Adhesion: 64 ounces force/inch in width.

4. Elongation: 500 percent.

5. Tensile Strength: 18 lbf/inch in width.

2.07. INSULATION INSERTS

S. Provide insert between support shield and piping on piping 1 1/2" diameter or larger. Inserts shall be factory fabricated of heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1. 1 1/2" to 2 1/2" pipe size 10" long

2. 3" to 6" pipe size 12" long

3. 8" to 10" pipe size 16" long

4. 12" and over 22" long

2.08. PIPE INSULATION ACCESSORIES

T. Vapor Retarder Lap Adhesive: Compatible with insulation.

U. Covering Adhesive Mastic: Compatible with insulation.

V. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12-inch centers.

W. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

X. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

Y. Adhesives: Compatible with insulation.

Z. Banding:

1. Aluminum bands, 3/4" x 0.02 inches

2. Stainless Steel, 304, 3/4" by 0.02 inches

PART 3 - EXECUTION

3.01. PREPARATION

A. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping shall be completely dry at the time of application. Insulating piping where condensate is occurring is unacceptable. Wet insulation is unacceptable and shall be removed and replaced before acceptance by the Owner.

B. Coordinate insulation installation with trade installing heat trace. Comply with requirements for heat tracing that apply to insulation.

C. Verify that piping has been tested for leakage before applying insulation.

3.02. GENERAL INSTALLATION REQUIREMENTS

D. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards, and shall conform to codes and ordinances of authorities having jurisdiction.

E. Installation of insulation and jacket materials shall be in accordance with manufacturer's published instructions.

F. Handle and install materials in accordance with manufacturer's instructions in the absence of specific instructions herein.

G. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.

H. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

I. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

J. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

K. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

L. Install insulation with longitudinal seams at top and bottom of horizontal runs.

M. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

N. Keep insulation materials dry during application and finishing.

O. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

P. Install insulation with least number of joints practical.

Q. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

R. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

S. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

T. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

U. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

V. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere and seal patches similar to butt joints.

W. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.03. PENETRATIONS

X. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

Y. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

Z. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

AA. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

BB. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Comply with requirements in Section 15050 for firestopping and fire-resistive joint sealers.

CC. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 15050."

3.04. GENERAL PIPE INSULATION INSTALLATION

DD. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

EE. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket where concealed unions, check valve or piping specialties are insulated. Provide descriptive label at device under the insulation. For example at each union stencil with the word "union." Match size and color of pipe labels.

FF. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

GG. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05. INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

HH. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

II. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

JJ. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

KK. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.06. INSTALLATION OF GLASS-FIBER PREFORMED PIPE INSULATION

LL. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on below-ambient surfaces, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

MM. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

NN. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with bands.

OO. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.07. FIELD-APPLIED JACKET INSTALLATION

PP. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

QQ. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.08. FINISHES

RR. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

SS. Do not field paint aluminum jackets.

3.09. PIPING SYSTEMS INSULATION SCHEDULE

PIPING SYSTEMS INSULATION SCHEDULE					
Service	Insulation Type	Location	Jacket Type	Pipe Size	Insulation Thickness by Pipe Size
COLD PIPING					
Refrigerant Suction	P2	Interior Concealed	--	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Interior Exposed	J1	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Unconditioned Space	--	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Exterior	J2	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Equipment Rooms: below 7.0" above floor	J1	3.0" and smaller	0.75"

				4.0" and larger	1.0"
Cooling Coil Condensate Drain Branch Lines	P2	Interior Concealed	--	3.0" and smaller	0.5"
				4.0" and larger	0.75"
Cooling Coil Condensate Drain Main Lines		Interior Exposed	J1	3.0" and smaller	0.5"
				4.0" and larger	0.75"
HOT PIPING					
Refrigerant Hot Gas	P2	Interior Concealed	--	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Interior Exposed		3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Unconditioned Space	--	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Exterior	J2	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Equipment Rooms below 7.0" above floor		3.0" and smaller	0.75"
				4.0" and larger	1.0"

END OF SECTION 23 0086

SECTION 23 0090 - SUPPORTS, HANGERS AND ANCHORS

PART 1 GENERAL

1.01. WORK INCLUDED

A. Inserts, Anchors, and Upper Attachments

B. Pipe Hangers, Rods, Supports, and Accessories

C. Fabricated Steel Support

1.02. QUALITY ASSURANCE

A. Design of pipe supporting elements shall be in accordance with ANSI B31.1

B. Fabrication and installation of pipe hangers and supports shall be in accordance with the following Manufacturers Standardization Society (MSS) Standards:

1. SP-58 Pipe Hangers and Supports: Materials, Design and Manufacture.

2. SP-69 Pipe Hangers and Supports: Selection and Application.

3. SP-89 Pipe Hangers and Supports: Fabrication and Installation Practices.

C. Steel angles, channels and plate shall be in accordance with ASTM A36, red primed or hot dipped galvanized for interior applications and hot galvanized for exterior applications.

D. Bolts, including nuts and washers, used for fabricating steel members shall be in accordance with ASTM A325 and shall be stainless steel or plated for corrosion protection. Plain steel components are unacceptable.

E. Welding of steel members shall be in accordance with AWS D1.1.

F. Steel supports for ducts, pipe anchors, pipe guides, and piping supported from below shall be fabricated in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for buildings. If required, the Contractor shall include the cost of the services of a structural engineer to design or review the system.

1.03. APPLICABLE PUBLICATIONS

A. Applicable sections of the publications listed below form a part of this Section. The publications are referenced by the basic designation only.

1. American Institute of Steel Construction (AISC)

2. American National Standards Institute (ANSI)

3. American Society for Testing and Materials (ASTM)

4. American Welding Society (AWS)

5. The Manufacturer's Standardization Society of the Valve and Fittings Industry

(MSS)

6. National Fire Protection Agency (NFPA)
7. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

1.04. SUBMITTALS

A. Submit schedule indicating type of hanger to be used by system and pipe size. Include rod size for each hanger size.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Provide shop drawings for fabricated steel supports.

PART 2 PRODUCTS

2.01. ACCEPTABLE MANUFACTURERS

A. Inserts, Anchors, and Upper Attachments:

1. Anvil International, Inc.
2. Carpenter Paterson, Inc.
3. Cooper B-Line, Inc.
4. Elecen Metal Products
5. Hilti
6. Unistrut
7. ITW Red Head

B. Pipe Hangers, Rods, Supports and Accessories:

1. Anvil International, Inc.
2. Carpenter Paterson, Inc.
3. Cooper B-Line, Inc.
4. Elcen Metal Products
5. Hilti
6. Unistrut

C. Fabricated Steel Support: As indicated on Drawings.

2.02. DESIGN REQUIREMENTS

A. Supports capable of supporting the pipe for all service and testing conditions. Provide 4-to-1 safety factor.

B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.

C. Design supports and hangers to allow for proper pitch of pipes.

D. For chemical and waste piping, design, materials of construction, and installation of pipe hangers, supports, guides, restraints, and anchors:

1. ASME B31.3.

2. MSS SP-58 and MSS SP-69.

3. Except where modified by this Specification.

E. For steam and hot and cold water piping, design, materials of construction and installation pipe hangers, supports, guides, restraints and anchors:

1. ASME B31.1

2. MSS SP-58 and MSS SP-69.

F. Check all physical clearances between piping, support system, and structure. Provide for vertical adjustment after erection.

G. Support vertical pipe runs in pipe chases at base of riser. Support pipes for lateral movement with clamps or brackets.

H. Place hangers on outside of pipe insulation. Use a pipe covering protection saddle for insulated pipe at support point.

I. Fabricated Steel Supports: As detailed on the drawings.

2.03. INSERTS AND ANCHORS

A. Inserts: MSS Type 18; malleable iron body and nut, galvanized finish, opening in top of insert for reinforcing rod, lateral adjustable.

B. Anchors: Steel shell and expander plug, snap off end fastener

2.04. HORIZONTAL PIPING HANGERS AND SUPPORTS

A. Select size of hangers and supports to exactly fit pipe size for bare piping, and around piping insulation with saddle or shield for insulated piping.

B. For suspension of non-insulated or insulated stationary pipe lines: Adjustable steel clevices, MSS Type I.

C. For suspension of non-insulated stationary pipe lines: Adjustable band hangers, MSS Type 7 or 9; or split pipe rings, MSS Type II.

D. For support of piping where horizontal movement due to expansion and contraction may occur, and where a low coefficient of friction is desired: Pipe slides and slide plates, MSS Type 35, including guided plate mounted on a concrete pedestal or structural steel support.

E. For support from floor stanchion, using floor flange to secure stanchion to floor: Adjustable pipe stanchion saddles, MSS Type 37 or 38, including steel pipe base support and cast-iron floor flange.

F. For suspension of pipe from two (2) rods where longitudinal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

G. For suspension of pipe from a single rod where horizontal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

H. For support of pipe from a single rod where vertical adjustment is not necessary: Pipe roll stands, MSS Type 45.

I. For support of pipe where small horizontal movement due to expansion and contraction may occur, but vertical adjustment is not necessary: Pipe rolls and plates, MSS Type 45.

J. For support of pipe lines where vertical and lateral adjustment during installation may be required in addition to provision for expansion and contraction: Adjustment pipe rolls stands, MSS Type 46.

2.05. VERTICAL PIPING CLAMPS

A. Select size of vertical piping clamps to exactly fit size of bare pipe.

B. For support and steadying of pipe risers: Two-bolt riser clamps, MSS Type 8 or 42.

2.06. HANGER ROD ATTACHMENTS

A. Select size of hanger rod attachments to suit hanger rods.

B. For adjustment up to six (6) inches for heavy loads: Steel turnbuckles, MSS Type 13.

C. For use on high temperature piping installations: Steel clevices, MSS Type 14.

D. For use with split pipe rings, MSS Type II: Swivel turnbuckles, MSS Type15.

E. For attaching hanger rod to various types of building attachments: Malleable iron sockets, MSS Type 16 or 17.

F. Rods:

1. Size 3/8" and up: All thread steel rod electro galvanized. Sizing for pipe or equipment support as follows:

Copper Tube, Plastic	Steel, Cast Iron		
Pipe Size (Copper, Plastic)	Pipe Size (Steel, Cast Iron)	Rod Size	Max. Equip. Load
1/4" to 2"	1/4" to 2"	3/8"	730 lbs.
2-1/2" to 4"	2-1/2" to 3"	1/2"	1,350 lbs.
6"	4"	5/8"	2,160 lbs.
8" to 12"	6"	3/4"	3,230 lbs.

14"	8" to 12"	7/8"	4,480 lbs.
16"	14" to 16"	1"	5,900 lbs.
18" to 20"	18" to 20"	1-1/4"	9,500 lbs.
22" to 42"	22" to 42"	1-1/2"	13,800 lbs.

2. Rods may be reduced one size for double rod hangers with 3/8" minimum diameter, or when other paragraphs require a minimum of 2 hangers per section, provided the minimum diameter of 3/8" is maintained.

G. For upper attachment for suspending pipe hangers from concrete: Concrete inserts MSS Type 18.

H. For attachment to top flange of structural shape: Top beam C-clamps, MSS Type 19.

I. For attachment to bottom flange of structural shape: Side beam or channel clamps, MSS Type 20 or 27.

J. For attachment to center of bottom flange of beams: Center beam clamps, MSS Type 21.

K. For attachment to bottom of beams where heavy loads are encountered and hanger rod sizes are large: Welded attachments, MSS Type 22.

L. For attachment to structural shapes: C-clamps, MSS Type 23.

M. For attachment to top of beams when hanger rod is required tangent to edge of flange: Top I-beams clamps, MSS Type 25.

N. For attachment to bottom of steel I-beams for heavy loads: Steel I-beam/WF-beam clamps with eye nut, MSS Type 28 or 29.

O. Steel brackets, for indicated loading:

1. Light duty, 750 pounds, MSS Type 31.

2. Medium duty, 1,500 pounds, MSS Type 32.

3. Heavy duty, 3,000 pounds, MSS Type 33.

P. For use on sides of steel beams: Side beam brackets, MSS Type 34.

2.07. SPRING HANGERS AND SUPPORTS

A. Select spring hangers and supports to suit pipe size and loading.

B. For control of piping movement: Restraint control devices, MSS Type 47.

C. For light loads where vertical movement does not exceed 1-1/4 inch: Springs cushion hangers, MSS Type 48.

D. For equipping Type 41 roll hanger with springs: Spring cushion roll hangers, MSS Type 49.

E. For retardation of sway or thermal expansion in piping systems: Spring way braces, MSS Type 50.

F. For absorbing expansion and contraction of piping system from hanger: Variable spring hangers, MSS Type 51; preset to indicated load and limit variability factor to 25%.

G. For absorbing expansion and contraction of piping system from base support: Variable spring base supports, MSS Type 52; preset to indicated load and limit variability factor to 25%; include flange.

H. For absorbing expansion and contraction of piping system from trapeze support: Variable spring trapeze hangers, MSS Type 53; preset to indicated load and limit variability factor to 25%.

I. Constant supports: Provide one of the following types, selected to suit piping system. Include auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.

1. Horizontal Type: MSS Type 54.

2. Vertical Type: MSS Type 55.

3. Trapeze Type: MSS Type 56.

2.08. SUPPLEMENTARY SUPPORTS

A. Where support spacing is more frequent than distance between structural members, provide steel angles, channels or beams sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer pipe support loads to structural members.

B. Where deflection of center of trapeze support exceeds 1/240 of distance between hanger rods, provide additional hanger rods.

C. Where multiple risers are supported within shafts, provide steel angles, channels or beams, sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer loads to the concrete floor slab. Anchor supplemental supports to the slab, and provide resilient element where required by other Sections of this Division.

2.09. ACCESSORIES

A. Protective Shields, MSS Type 40: Carbon steel, galvanized minimum of 12" length sized for required insulation.

B. Protective Saddles, MSS Type 39: Carbon steel plate, minimum of 12" length, sized for required insulation.

C. Steel Turnbuckle, MSS Type 13: Forges steel, galvanized finish with locknuts. Rated at a minimum of 730 lbs. at 3/8" size.

D. Steel Clevis, MSS Type 14: Forged steel, galvanized finish with steel pin and cotter pin. Rated for a minimum of 730 lbs. at 3/8" size.

E. Weldless Eye Nut, MSS Type 17: Forges steel, galvanized finish. Rated for a minimum

of 730 lbs. at 3/8" size.

2.10. PIPE INSULATION HANGER SHIELDS

A. Where hangers are placed outside the jackets of pipe insulation, provide shields equal to "Thermal Hanger Shields" as manufactured by Pipe Shields, Inc. or equivalent by Elcen Metal Products Company.

B. Shields shall consist of a 360-degree insert of high-density, 100 psi, waterproof calcium silicate, encased in a 360-degree galvanized sheet steel shield. Insert shall be same thickness as adjoining pipe insulation, and shall extend 1 inch beyond sheet metal shield in each direction on cold lines. Shield lengths and minimum sheet metal gauges shall be as directed below:

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2" to 1-1/2"	4"	26
2" to 6"	6"	20
8" to 10"	9"	16
12" to 18"	12"	16
20" & Larger	18"	16

C. Shields shall be Model CS-CW, except for pipe roller applications: then provide Model CSX-CW.

D. At the Contractor's option, shop-fabricated galvanized metal shields may be provided based on approved shop drawings. Length and gauge of sheet metal shall be as specified above.

E. For all insulated piping 4” and larger, provide insulation insert at a minimum of 12” long. Insert shall extend a minimum of one inch beyond shield. Insulation inserts shall be minimum 12” long section of foam glass insulation.

2.11. METAL FRAMING: Provide products compliant with NEMA ML-1.

2.12. STEEL PLATES, SHAPES AND BARS: Provide products compliant with ANSI/ASTM A-36.

2.13. PIPE GUIDES: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base, with a two-section guiding spider bolted tight to pipe or as shown on Drawings. Size guides and spiders to clear pipe, cylinder and insulation, if any. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 EXECUTION

3.01. GENERAL REQUIREMENTS

A. Where applicable, install in accordance with the manufacturer's written installation

instructions.

B. Where supports are in contact with copper pipe, provide copper plated support.

C. Where supports are in contact with glass, aluminum or brass pipe, provide plastic coating on supports.

D. Interior hangers, supports, including attachments, that are plain steel shall be primed and painted.

E. Hangers and supports, including attachments, exposed to weather or located in utility tunnels or accessible utility trenches or subject to spillage shall be hot dip galvanized after fabrication.

F. Fabricated steel supports exposed to weather or located in utility tunnels and accessible utility trenches or subject to spillage shall be primed and painted. Cut, welded, drilled or otherwise damaged surfaces of coating shall be repaired.

3.02. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including but not limited to proper placement of inserts, anchors and other building structural attachments.

3.03. INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps and attachments to support piping properly from building structure in compliance with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together in trapeze-type hangers where possible. Install supports with maximum spacing as specified in this Section. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for small diameter pipe. Do no use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire protection water piping independently of other piping

D. The location of hangers and supports shall be coordinated with the structural work to ensure that the structural members will support the intended load.

E. Provide hex head nut on rod at top and bottom of clevis hanger yoke, and at each rod connection to intermediate und upper attachment. Rod nuts shall be securely locked in place.

F. Hanger rods shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing.

G. Hangers shall be fabricated to permit adequate adjustment after erection while still

supporting the load. Turnbuckles shall be provided where required for vertical adjustment of the piping.

H. Supports for vertical piping shall be located at each floor or at intervals of not more than 15 feet and at intervals of not more than 8 feet from end of risers. Where supports are provided on intermediate floors spaced 15 feet or less between floors, no additional supports are required other than those specified for end of risers.

I. A hanger or support shall be provided adjacent to each piece of equipment to ensure that none of the pipe weight is supported from the equipment.

J. Provide protective shields on all piping required to be insulated.

K. Provide protective saddles sized to match insulation thickness on all hot piping required to be insulated. Fill void between saddle and pipe with insulation as specified.

L. Provide turnbuckles on all hangers that require leveling or aligning.

M. Provide steel clevis where detailed and/or required.

N. Provide weldless eye nuts on hanger terminations where disassembly or swing may be required. Use in combination with steel clevis.

O. Supports

1. Provide additional supports at:

a. Changes in direction.

b. Branch piping and runouts over 5 feet.

c. Concentrated loads due to valves, strainers and similar items.

d. At valves 4 inches and larger in horizontal piping.

e. Support piping on each side of valve.

f. Brace hubless piping to prevent horizontal and vertical movement.

g. Where number of grooved couplings exceeds 3 between supports or provide continuous steel between supports.

2. Sanitary waste and vent, roof drains per UPC Section 316: Vertical supports are not required within 2.5 feet of wall penetrations for pipes 8 inches in diameter and smaller, and not more than 3 feet for 10 inches and larger.

3. Other piping support spacing shall be as scheduled on Drawing or as required by referenced standard.

3.04. HANGER SPACING

A. The maximum spacing between pipe supports for straight runs shall be in accordance with the following chart. If any deviation from the table exists within the manufacturer's written installation instruction, whichever spacing reflecting the smaller centerline to centerline dimension shall be used.

MAXIMUM HORIZONTAL PIPE HANGER AND SUPPORT SPACING TABLE

1. Steel Pipe (Schedule 40 & 80):
   Up to 1".....7 ft. on center
   1-1/4" and greater .....10 ft. on center

2. Copper Pipe (Types L, K and M):
   Up to 1" size: .....5 ft. on center
   1-1/4" to 2-1/2" .....7 ft. on center
   3" and larger.....10 ft. on center

3. Ductile Iron and Cast Iron: Two hangers per section length.

4. Polyvinyl Chloride (PVC):
   Up to 1-1/2" .....3 ft. on center
   2" to 4" .....4 ft. on center
   5" to 8" .....5 ft. on center
   10" and larger.....6 ft. on center

5. Sprinkler and Standpipe: Pipe hangers to be as per NFPA-13 and NFPA-14 standards.

B. Hanger centerline spacing shall be reduced by 50% in areas of concentrated valves and/or fittings, also no more than a maximum distance of 12 inches from valves, fittings and/or couplings, or 24 inches from a change in direction.

3.05. ATTACHMENT TO STRUCTURE

A. For plain steel devices, prime and paint.

B. Adjust attachment location for proper alignment and no more than 4 degrees offset from a perpendicular alignment.

C. If proper alignment cannot be achieved from the existing building structure, provide a trapeze type support sized to handle the design load with a minimum safety factor of 5.

3.06. INSERTS

A. Contractor shall have inserts at site and dimensional location drawings ready at the beginning of the involved concrete work.

B. Install inserts by securing to concrete forms and inserting reinforcing rod through the opening provided in the insert in accordance with shop drawings.

C. Provide necessary supervision while concrete is being poured to correct any misalignment caused by the concrete.

3.07. INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B-31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bards to piping and to

structure. Comply with ANSI B-31, with AWS standards, and with the Details shown on the drawings.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required, accommodating both expansion and contraction of piping.

E. Size anchor shell length to assure a minimum of 1" solid concrete remaining from shell and to concrete face.

3.08. INSTALLATION OF TRAPEZES OR PIPE RACKS

A. Light/Medium Duty: Assemble from standard manufactured metal framing systems, in accordance with manufacturer's recommendations.

B. Heavy Duty: Fabricate from structural steel shapes selected for loads required. Weld steel in accordance with AWS standards.

3.09. AUXILIARY STEEL

A. Furnish all miscellaneous structural members necessary to hang or support ductwork, piping, and mechanical equipment.

B. Notify Engineer of any adjustment necessary in main structural system for proper support of major equipment.

C. Fabricated Steel Supports: Steel for supports shall be saw cut, with sharp edges ground smooth. After fabrication, remove all foreign material, including welding slag and spatter, and leave ready for painting.

END OF SECTION

SECTION 23100 - VIBRATION ISOLATION AND SEISMIC RESTRAINT FOR MECHANICAL COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The work under this section is subject to the requirements of the Contract Documents, including General and Supplementary Conditions and Division 01 General Requirements.

Specifications throughout all Divisions are directly applicable to this Section, and this Section is directly applicable to them. In the event that this section conflicts with the requirements of other Sections, the more stringent criteria shall apply.

1.2 DESCRIPTION

This section includes requirements for vibration isolation and seismic restraint of nonstructural components in Risk Category I, II, III, & IV structures, including, but not limited to:

1. Mechanical Components: heating, ventilating, and air-conditioning systems; hot/chilled water systems; boiler equipment and components; tanks and vessels, etc.

Work in this section includes the restraint design and/or equipment/product certifications to be submitted for review by the registered design professional.

1.3 DEFINITIONS

Active Equipment: Equipment with dynamic moving or rotating parts or parts that are energized.

Attachments / Anchorage: Means by which nonstructural components or supports for nonstructural components are secured or connected to the seismic-force resisting system of the structure. Such attachments may include anchor bolts, welded connections, mechanical fasteners or other approved attachment devices. Friction attachments do not constitute positive attachments.

Bracing: Struts, braces, cables, anchors or other structural elements providing restraint for nonstructural components to prevent excessive movement.

Certificate of Compliance: A certificate, supplied by the component manufacturer, stating that materials and products meet specified standards and project specific requirements.

Component Importance Factor (I_p): Factor applied to a component that defines the criticality of that component. This factor can be 1.0 or 1.5 in accordance with ASCE 7, Section 13.1.3.

Consequential Damage: Failure of an essential component caused by the failure of a separate essential or non-essential component due to the functional and physical interrelationship of the components, their supports, and their effect on each other.

Designated Seismic System: Those nonstructural components that require design in accordance with Chapter 13 of ASCE 7, for which the Component Importance Factor (Ip) is 1.5 in accordance with Section 13.1.3 of ASCE 7.

Special Seismic Certification: A certificate of compliance, supplied by the manufacturer of Active Designated Seismic Systems, which certifies that the equipment will remain operable during the design seismic event. Components with hazardous contents shall be certified as maintaining containment following the design seismic event.

Structure: The load-bearing building elements designed by the Structural Engineer of Record. Non-load bearing partition walls, unreinforced slabs or other building elements that do not provide direct load transfer to the load-bearing building elements shall not be defined as part of the Structure and cannot be used for attachment of seismic restraints.

Supports: Those members, assemblies of members, or manufactured elements, including braces, frames, legs, snubbers, curbs, rails, hangers, saddles or struts, and associated fasteners that transmit loads between non-structural components and their attachments to the structure.

1.4 REGULATORY REQUIREMENTS

Comply with the 2015 International Building Code (IBC) and applicable local adopted amendments, and the 2010 Edition on ASCE 7 (ASCE 7-10).

1.5 DESIGN PERFORMANCE CRITERIA

Provide seismic restraint of components to withstand seismic forces and displacements without displacing or overturning. Design of seismic restraint shall be performed in accordance with the 2015 International Building Code and ASCE 7-10, as follows.

1. Seismic forces shall be determined in accordance with Chapter 13 of ASCE 7-10. The seismic design parameters shall be as noted in the project Structural drawing. The assigned Component Importance Factors (Ip) for each component, shall be as noted on the project drawings and/or specifications.

2. For components installed on the exterior of the building, wind forces shall be determined in accordance with Chapter 29 of ASCE 7-10, except that the uplift forces per Equation 29.5-3 shall be considered regardless of the building height. Reference the Structural drawings for wind design criteria.

3. In addition to seismic and wind loads, consideration shall be given to other loads, including but not limited to dead, live, snow, etc., as applicable. All restraint design shall be based on the "worst case" combination of the applicable loads as prescribed by the referenced code and standards.

4. Consideration shall also be given to thermal stresses and expansion. Where thermal expansion applies, seismic restraint design shall be in accordance with the requirements of ASME B31.1 in addition to ASCE 7.

1.6 SUBMITTALS

Submit under the provisions of Division 1. Submittals shall include Product Data, Shop Drawings and the required Certificates of Compliance as described below.

Shop drawings shall be prepared and sealed by a professional engineer licensed in the state of the project, with a minimum of 5 years of experience in the design of vibration isolation and seismic restraint.

Vibration Isolation: submit the following, at a minimum, as applicable.

1. Detailed schedules of equipment requiring isolation, including clearly identified equipment identification or tag and equipment weight, and corresponding isolator type, manufacturer and model number.

2. Detailed drawings showing equipment, isolator bases and isolator spacing.

3. Descriptive data or cut sheets for each type of isolation mounting, including:

    a. Dimensional data

    b. Materials and finish

    c. Rated loads

    d. Rated deflection

    e. Isolator free and operating heights

    f. Detailed installations instructions

Seismic Restraint: submit the following, at a minimum, as applicable.

4. Catalog cut or data sheets on specific restraints detailing compliance with the project drawings and specifications.

5. Detailed schedules of components, showing seismic restraints by referencing numbered descriptive drawings.

6. Description, layout and location of items to be restrained with anchorage or brace points noted and dimensioned.

7. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, fasteners, bolts, welds etc. clearly identified and specified.

8. Numerical value of design seismic restraint loads, or controlling loads if different than load combinations with seismic, with all supporting calculations.

9. Detailed installation instructions for seismic restraints.

10. Acceptable attachment methods of seismic restraints to structural members.

11. Fabrication details for equipment bases including dimensions, structural member sizes and support point locations.

12. Details for housekeeping pads for base-mounted equipment, including reinforcing and doweling requirements to the building structure.

13. Documentation verifying seismic prequalification for anchors in concrete per ACI 318 Appendix D.

14. Additional information as required to substantiate adequate design and installation of seismic restraints.

15. Manufacturer's Seismic Certificate of Compliance: Each manufacturer of a Designated Seismic System (with a Component Importance Factor, Ip = 1.5) shall submit a ***Certificate of Compliance*** for review and acceptance by the design professional in responsible charge and the authority having jurisdiction, prior to installation.

PART 2 - PRODUCTS

2.1 GENERAL

All materials and devices shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

Refer to the “Selection Guide” table in Section 4 to correlate the specification references listed below with the appropriate components.

2.2 MANUFACTURERS

Isolators and seismic restraints shall be from the following manufacturers, or approved equals. Unless otherwise noted, the isolators and seismic restraint systems listed in the following sections are as manufactured by Gripple and California Dynamics.

1. Gripple
2. California Dynamics
3. The VMC Group
4. Mason Industries
5. Kinetics Noise Control
6. Cooper B-Line
7. CADDY
8. Hilti
9. Twin City Hose
10. Imperial Metals

2.3 EQUIPMENT BASES

Specification B-1 (Integral Structural Steel Base): Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Pump bases for split case pumps shall be large enough to support suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1". Bases shall be type XW as manufactured by California Dynamics Corporation or approved equal.

Specification B-2 (Wide Flange Structural Steel Base): Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Pump bases for split case pumps shall be large enough to support suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1". Bases shall be type XW as manufactured by California Dynamics Corporation or approved equal.

Specification B-3 (Concrete Inertia Base): Rectangular steel concrete pouring forms for floating concrete frames. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6". The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place on 12" centers running both ways in a layer 1 1/2" above the bottom. Height saving brackets shall be employed in all mounting locations to maintain a 1" clearance below the base. Base shall be type CW as manufactured by California Dynamics Corporation or approved equal

Specification B-4 (Non-Isolated Curbs): Non isolated seismically rated rooftop curb system that is flashed into roofing membrane. Air and watertight curb shall have a neoprene sponge seal at the top and be rigid enough to provide continuous perimeter support for rooftop unit. Curb must provide means to positively anchored to concrete deck, or bolted or welded directly to structural steel to withstand seismic loading. Curb shall provide a means by which contractor supplied insulation may be installed for thermal insulation and acoustic attenuation. Curbs shall accommodate roof pitch shown on drawings. **Curb shall use minimum 18 gage galvanized steel and shall be designed with crossbracing required to withstand the greater of calculated seismic forces and /or wind loading per local building code**. Design must be certified by registered professional engineer.

Specification B-5 (Isolated Curbs): Seismically rated rooftop isolation curb system that is flashed into roofing membrane. Standard unit curb will not be used. Air and watertight upper curb shall have a neoprene sponge seal at the top and be rigid enough to provide continuous perimeter support for rooftop unit. The upper curb shall be supported by Spec SV-1 isolators welded or bolted to concrete deck to the structure to withstand seismic loading. An EPDM nylon reinforced air tight weatherproof seal shall consolidate the upper and lower curbs. The lower curb shall be weatherproof and provide a base that the roofing system may be flashed to. Weatherproof access panel shall be provided at each isolator to allow isolator adjustment. Isolation curb shall provide a means by which contractor supplied insulation may be installed for thermal insulation and acoustic attenuation. Curbs shall accommodate roof pitch shown on drawings**. Isolation curb shall be designed to withstand the greater of calculated seismic forces and / or wind loading per local building code**. Design must be certified by registered professional engineer.

Specification B-6 (Non-Isolated Rails): Non isolated seismically rated rooftop rail system that provides equipment support in one roof flashed assembly with all features as described for Non-Isolated Curbs.

Specification B-7 (Isolated Rails): Vibration isolation manufacturer shall provide steel members welded to height saving brackets to cradle equipment having legs or bases that do not require a complete supplementary base. Members shall have sufficient rigidity to prevent misalignment of equipment. Structural steel rails shall be type, WW as manufactured by California Dynamics Corporation or approved equal.

2.4 VIBRATION ISOLATION

Specification V-1 (Pad Type Elastomer Isolator): A pad type mounting consisting of two layers of ribbed elastomeric pads with a 1" sandwich pad in between. Where the equipment foot is less than 80 percent of the surface of the pad a load distribution plate must be added to the top of the pad. Pads shall be VT as manufactured by California Dynamics Corporation or approved equal.

Specification V-2 (Neoprene Mounting): Elastomeric mounts single or double-deflection type, oil-resistant rubber or Neoprene isolator element with factory-drilled, bonded in place top plate for bolting to equipment and factory drilled base plate for bolting to structure. Color-coded or otherwise identify to indicate capacity range. Mount shall be type RM/RMD as manufactured by California Dynamics Corporation or approved equal.

Specification V-3 (Spring Isolator, Free Standing): Spring isolators shall be free standing and laterally stable without any housing and complete with a Neoprene acoustical pad between the base plate and the spring support. All mountings shall have load transfer bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Mountings shall be type SSL/K, as manufactured by California Dynamics Corporation or approved equal.

Specification V-4 (Elastomer Hanger Isolator): Hanger shall consist of a rigid steel frame and up to ½"deflection of a molded Neoprene element projecting thru the steel box so that no metal-to-metal contact occurs. Hanger shall be type RH/RHD as manufactured by California Dynamics Corporation or approved equal.

Specification V-5 (Spring Hanger Isolator): Hanger shall consist of a rigid steel frame containing a steel spring with a Neoprene sleeve to prevent steel to steel contact. Hanger shall be type CH as manufactured by California Dynamics Corporation or approved equal

Specification V-6 (Combination Spring/Elastomer Hanger Isolator): Hangers shall consist of rigid steel frames containing double deflection Neoprene element at the top and a steel spring and a Neoprene sleeve on bottom to position spring and prevent steel to steel contact. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30^{o} arc from side to side. Hangers shall be type HH30 as manufactured by California Dynamics Corporation or approved equal.

2.5 VIBRATION ISOLATION WITH SEISMIC RESTRAINT

Specification SV-1 (Seismically Restrained Spring Isolator): Restrained spring isolators shall be free standing, laterally stable, springs with seismic restraints. A steel housing with cushioned lateral and vertical limit stops to restrict spring extension due to wind loads, or when weight is removed. The housing shall be Zinc plated. A clearance of ¼" maximum shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Outside spring diameter not less than 80 percent of the compressed height of the spring at rated load. Minimum additional travel 50 percent of the required deflection at rated load. Isolator/Restraint shall be CQA as manufactured by California Dynamics Corporation or approved equal. This product is an OSHPD/ DSA approved product. Product tested for IBS.

Specification SV-2 (Seismically Restrained Spring Isolator): Restrained spring isolators shall be free standing, laterally stable, springs with seismic restraints. A welded housing with cushioned lateral and vertical limit stops to restrict spring extension due to wind loads, or when weight is removed. A clearance of ¼" maximum shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Outside spring diameter not less than 80 percent of the compressed height of the spring at rated load. Minimum additional travel 50 percent of the required deflection at rated load. Isolator/Restraint shall be DLK as manufactured by California Dynamics Corporation or approved equal.

Specification SV-3 (Neoprene Mounting with Seismic Snubber) JQTQN Restrained Neoprene isolators shall be free standing, with a rated static defection of .5". A steel housing with cushioned lateral and vertical limit stops to restrict extension due to wind loads, or when weight is removed. The housing shall be hot-dipped galvanized or zinc plated. Hot-Dipped zinc coating shall be not less than 2 ounces per square foot complying with ASTM A123. A clearance of ¼ "maximum shall be maintained around restraining bolts and between the housing and the Neoprene so as not to interfere with the isolator action. Limit stops shall be out of contact during normal operation. Isolator/Restraint shall be JQTQN as manufactured by California Dynamics Corporation.

2.6 SEISMIC RESTRAINTS

Specification S-1 (Seismic Snubbers): All directional seismic restraints shall consist of interlocking steel members. Neoprene shall have a minimum thickness of ¼". Incorporate a minimum air gap of 1/8", and a maximum air gap of ¼" in the design, before contact is made between the rigid and resilient surfaces. Provide removable end plate to allow inspection of internal clearances. Restraints shall be type RL-A/ RL-C as manufactured by California Dynamics Corporation.

Specification S-2 (Seismic Cable Restraints): A restraint assembly for suspended equipment, piping or ductwork consisting of high strength galvanized steel aircraft cable. Cable Restraints shall be listed with any one of following evaluation agencies with certified break strength and shall be color-coded or include a tag for easy field verification.

1. IAPMO-UES

2. ICC-ES

3. OSHPD

4. Underwriters Laboratories (UL)

Secure cable to structure and braced component through bracket or stake eye specifically designed to meet or exceed cable restraint rated capacity. Cable must be manufactured to meet or exceed minimum materials and standard requirements per ASTM A1023 or EN-12385 or other approved equivalent. Cables shall be installed to prevent excessive seismic motion and so arranged that they do not engage during normal operation. Restraint shall be Gripple Inc. GS series.

Specification S-3 (Rigid Brace Restraints): A restraint assembly for suspended equipment, piping or ductwork consisting of steel angles or channels. Rigid braces and connecting elements shall be sized for the applied seismic loads. Connecting elements shall be steel assemblies that swivel to the final installation angle and utilize two anchor bolts to provide proper attachment. Restraint shall be CADDY Strut Seismic Hinge.

2.7 FLEXIBLE PIPE CONNECTIONS

Specification F-1 (Water Service Flexible Connection):

1. For flanged connections – A double sphere arch rubber expansion joint constructed of molded reinforced neoprene with integral steel floating flanges, and designed to be suitable for pressures up to 225 PSI (4 to 1 safety factor) and temperatures up to 225 degrees F. Connectors shall have minimum movement capabilities of 1.77" compression, 1.18" lateral and 1.18" extension. Connectors shall provide a minimum 35 degree angular movement up to 6", minimum 30 degree up to 12" and minimum 20 degree up to 24". Spring loaded control units shall be furnished to limit movement to within allowables. Flex connector shall be Twin City Hose Type MS2.

2. For threaded type – A double spherical rubber hose connector, minimum 8" long, constructed of molded neoprene, nylon cord reinforced, with female pipe unions each end. Connectors shall have a minimum movement capability of 7/8" compression, 7/8" lateral, ¼" extension and 20 degree angular through 1-1/4", 13 degree through 2", and 9 degree through 3". Connectors shall be suitable for a maximum working pressure (4 to 1 safety factor) of 150 psi and 225 degree F. Connectors shall have cable control units to limit extension to ¼". Flex connector shall be Twin City Hose Type MSFU.

Specification F-2 (Steam and Condensate Service):

3. For flanged connection – A metal hose connector constructed of stainless steel hose and braid with carbon steel plate flanges. Live lengths shall conform to hose minimum length to absorb thermal and dynamic movement. Hose axis must be perpendicular to pipe movement. Flex connector shall be Twin City Hose Type TCHS-FLG.

4. For threaded connections – A metal hose connector constructed of stainless steel hose and braid with carbon steel NPT threaded end fittings. Flex connector shall be Twin City Hose Type TCHS-MMT.

PART 3 - EXECUTION

3.1 EXAMINATION

All areas that will receive components requiring vibration isolation and seismic restraint shall be thoroughly examined for deficiencies that will affect the installation or performance of the installed devices. Such deficiencies shall be corrected prior to the installation.

3.2 INSTALLATION, GENERAL

Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

All installation shall be in accordance with the requirements set forth in the project drawings and specifications, as well as the manufacturer's published instructions and all approved submittal data.

Do not anchor components to gypsum wallboard, plaster or other wall or ceiling finish that has not been engineered to resist imposed loads.

3.3 SEISMIC RELATIVE DISPLACEMENTS

Provide joints with sufficient flexibility capable of accommodating seismic relative displacements as follows.

1. Vertical ductwork, piping, etc. that pass between floors of the building,
2. Components that pass through a building seismic or expansion joint,
3. Rigidly supported components that connect to other components.

3.4 POST-INSTALLED ANCHORS:

Install all anchors in accordance with the manufacturer's written instructions for seismic applications.

Post-installed anchors in concrete shall be seismically prequalified for use in cracked concrete based on seismic testing in accordance with ACI 355.2 for mechanical anchors or ACI 355.4 for adhesive anchors.

3.5 HOUSEKEEPING PADS

Housekeeping pads shall be designed by the seismic restraint vendor with adequate reinforcing and doweling to the building structure, so as to withstand calculated seismic or wind forces. Frictional resistance due to the effects of gravity shall be neglected.

The size & thickness of the housekeeping pad shall be determined to ensure adequate edge distances & embedment depths in order to obtain the desired equipment anchor capacities.

1. If cast-in-place anchors are used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.
2. If post-installed anchors are used, the minimum edge distances, embedment depths and concrete/masonry member thicknesses specified by the anchor manufacturer shall be maintained.

3.6 MECHANICAL COMPONENTS

Floor and base-mounted components, vibration isolated equipment and associated system vibration and seismic controls for connections.

1. Design equipment anchorage to resist seismic design force in any direction.

2. Design vibration and seismic controls for equipment to include base and isolator requirements.

3. Provide flexible connections between equipment and interconnected piping to account for seismic relative displacements.

4. Where equipment is mounted on vibration isolators, use isolators designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

5. Provide supplemental steel or concrete base as required for mounting equipment on isolators. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.

6. Where concrete floor thickness is less than required for expansion anchor installation per ICC-ESR, install through bolt in lieu of expansion anchor. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, furnish and install supplemental framing or blocking to transfer loads to structural elements.

7. Housekeeping pads shall be coordinated with the seismic restraint vendor based on the equipment anchorage specified in the seismic design.

Suspended mechanical equipment

8. Design support and bracing to resist seismic design force in any direction.

9. Provide flexible connections between equipment and interconnected piping to account for seismic relative displacements.

10. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.

Wall-mounted mechanical equipment

11. Design attachments to resist seismic design force in any direction.

12. Install backing plates or blocking as required to deliver load to primary wall framing members. Do not anchor to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads.

Piping

13. Provide supports, braces and anchors to resist gravity and seismic design forces.

14. Design piping and piping risers to accommodate interstory drift. Provide flexible connections wherever relative differential movements could damage pipe in an earthquake.

15. Brace every run (5’ or more in length) with two transverse and one longitudinal bracing locations. For pipes and connections constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections) provide transverse bracing at not more than 40 feet on center and longitudinal bracing at spacing not more than 80 feet on center. For pipes and their connections constructed of nonductile materials (cast iron, no-hub pipe and plastic or non-UL listed grooved coupling pipe), provide transverse bracing at not more than 20 feet on center and longitudinal bracing at spacing not more than 40 feet on center.

16. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.

17. Where piping is explicitly exempt from seismic bracing requirements,

    a. Install piping such that swinging of the pipes will not cause damaging impact with adjacent components. This will be considered satisfied if there is horizontal clear distance of at least 2/3 the hanger length between subject components.

    b. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.

Ductwork

18. Provide supports, braces and anchors to resist gravity and seismic design forces.

19. Design ducts and duct risers to accommodate interstory drift. Provide flexible connections wherever relative differential movement could damage duct in an earthquake

20. Provide independent support and bracing for all in-line devices weighing more than 75 pounds.

3.7 QUALITY CONTROL

Do not install vibration isolators or seismic restraints until submittals have been reviewed and approved by the registered design professional in responsible charge.

Verify that multiple systems installed in the same vicinity can be installed without conflict.

Verify tolerances between installed items to confirm that unbraced components will not come into contact with restrained equipment or structural members during an earthquake. When contact is possible, provide seismic restraint or provide justification to the satisfaction of the registered design professional in responsible charge of the project that contact will not cause unacceptable damage to the components in contact, their supports, finishes or other elements that are contacted.

Coordinate with the Structural Engineer of Record for confirming that the structure is capable of supporting the loads imposed by nonstructural components.

No work shall be concealed by the Contractor prior to the required inspections being performed and all discrepancies resolved. The Contractor shall be responsible for all repairs required to uncover uninspected or unapproved work.

Where Special Inspections are required per Sections 1704 and 1705 of the 2015 International Building Code, the owner shall engage a qualified agency to perform the required inspections for components listed in the project-specific Statement of Special Inspections.

PART 4 - EQUIPMENT ISOLATION AND SEISMIC RESTRAINT SCHEDULE

MECHANICAL EQUIPMENT

EQUIPMENT TAG	**Ip (Note 7)**	**ISOLATION SPEC.**	**ISOLATION DEFL.**	**SEISMIC REST. SPEC. (NOTE 1)**
PACKAGED RTU > 5 TONS	1.0	SPEC B-5	2”	SPEC B-5
PACKAGED RTU ≤ 5 TONS	1.0	N/A	N/A	SPEC B-4
GAS PACKAGED RTU > 5 TONS	1.5	SPEC B-5	2”	SPEC B-5
GAS PACKAGED RTU ≤ 5 TONS	1.5	N/A	N/A	SPEC B-4
SUSPENDED GAS FURNACE	1.5	V-6	1.5”	SPEC S-2
AIR HANDLING UNITS (FLOOR)	1.0	INTERNAL BY MANUF.	2”	NOTE 2
AIR HANDLING UNITS (SUSP)	1.0	SPEC V-6 SPEC F-1	1.5”	SPEC S-2
VAV (NON-FAN) TERM. < 20	1.0	NONE	N/A	NONE

EQUIPMENT TAG	Ip (Note 7)	ISOLATION SPEC.	ISOLATION DEFL.	SEISMIC REST. SPEC. (NOTE 1)
LB				
VAV (NON-FAN) TERM. ≥ 20 LB	1.0	NONE	N/A	SPEC S-2
FAN VAV TERMINAL	1.0	SPEC V-4	.5”	SPEC S-2
INLINE FANS	1.0	SPEC V-6	1.5”	SPEC S-2
CEILING FANS ≥ 20 LB	1.0	SPEC V-4	.5”	SPEC S-2
CEILING FANS < 20 LB	1.0	NONE	N/A	NONE
CEILING DIFFUSERS ≥ 20 LB	1.0	NONE	N/A	(2) 12 GA WIRES TO STRUCTURE, NOTE 3
WALL MOUNT FANS	1.0	NONE	N/A	NOTE 2
UTILITY SETS (FLOOR)	1.0	SPEC SV-2	1”	SPEC SV-2
UTILITY SETS (SUSP.)	1.0	SPEC V-6	1.5”	SPEC S-2
ROOF EXHAUST FANS	1.0	NONE	N/A	SPEC B-3
CHILLERS (ON GRADE)	1.0	SPEC V-1 SPEC F-1	.15”	NOTE 2
CHILLERS (ROOF OR UPPER FLOORS)	1.0	SPEC SV-1 SPEC F-1	2.0”	SPEC SV-1
BOILERS (ON GRADE)	1.5	SPEC V-1	.15”	NOTE 2
BOILERS (UPPER FLOORS)	1.5	SPEC SV-1	1”	SPEC SV-1
PUMPS (ON GRADE) < 7.5 HP	1.0	NONE SPEC F-1	.15”	NOTE 2
PUMPS (ON GRADE) ≥ 7.5 HP	1.0	SPEC B-3 & SV-2 SPEC F-1	1”	SPEC SV-2
PUMPS (UPPER FLOORS)	1.0	SPEC B-3 & SV-2 SPEC F-1	2”	SPEC SV-2
INLINE PUMPS < 5 HP	1.0	NONE	N/A	SPEC S-2

EQUIPMENT TAG	Ip (Note 7)	ISOLATION SPEC.	ISOLATION DEFL.	SEISMIC REST. SPEC. (NOTE 1)
INLINE PUMPS ≥ 5 HP	1.0	SPEC V-6	1.5”	SPEC S-2
AIR SEPARATORS & EXP. TANKS	1.0	NONE	N/A	NOTE 2
COOLING TOWERS (ON GRADE)	1.0	SPEC B-2 & V-1	.15”	NOTE 2
COOLING TOWERS (ROOF)	1.0	SPEC B-2 & SV-1	2.0”	SPEC SV-1
GAS PIPING	1.5	NOTE 6	N/A	SPEC S-2
GAS UNIT HEATERS (SUSP)	1.5	NONE	N/A	SPEC S-2
UNIT HEATERS (SUSP)	1.0	NONE	N/A	SPEC S-2
CABINET HEATERS (SUSP)	1.0	SPEC V-4	.5”	SPEC S-2
FAN COILS	1.0	SPEC V-6	1.5”	SPEC S-2
KITCHEN HOODS	1.5	NONE	N/A	SPEC S-2
WATER SOURCE HEAT PUMP (SUSP.)	1.0	SPEC V-6	1.5”	SPEC S-2
WATER SOURCE HEAT PUMP (FLOOR)	1.0	SPEC SV-2	1”	SPEC SV-2
STEAM TO WATER HEAT EXCHANGER	1.5	NONE	N/A	NOTE 2
WATER TO WATER HEAT EXHANGER	1.0	NONE	N/A	NOTE 2
EXPANSION TANK	1.0	NONE	N/A	NOTE 2
AIR SEPARATOR	1.0	NONE	N/A	NOTE 2
FLASH TANK	1.5	NONE	N/A	NOTE 2
CHILLED WATER PIPING	1.0	NOTE 6	N/A	SPEC S-2
HOT WATER PIPING	1.0	NOTE 6	N/A	SPEC S-2
STEAM PIPING	1.5	NOTE 6	N/A	NOTE 4
STEAM CONDENSATE PIPING	1.5	NOTE 6	N/A	NOTE 4

EQUIPMENT TAG	Ip (Note 7)	ISOLATION SPEC.	ISOLATION DEFL.	SEISMIC REST. SPEC. (NOTE 1)
DUCT	1.0	NOTE 6	N/A	SPEC S-2
DUCT USED FOR SMOKE CONTROL	1.5	NOTE 6	N/A	SPEC S-2

NOTES

1. Seismic restraint to be provided only where required in the project drawings.
2. Anchor bolts for non-isolated and internally isolated equipment shall be sized by the seismic engineer. If required, Spec. S-1 snubbers or Spec. S-2 cable kits shall be provided.
3. Diffusers weighing less than 20 lbs must be mechanically attached to ceiling grid, but require no additional restraint.
4. Anchors and guides to be designed to accommodate thermal expansion and seismic loads.
5. Roof curbs provided by others must be certified by a professional engineer for the required seismic loads.
6. Provide Type V-6 isolator for the first three hangers from all equipment specified with spring isolation.
7. All components in a Risk Category IV building are assigned a Component Importance Factor I_p equal to 1.5.

END OF SECTION

SECTION 23 0160 - MECHANICAL SYSTEMS INSULATION

PART 1 GENERAL

1.01 Provide required insulation for HVAC ductwork and plumbing piping.

1.02 All ductwork and piping is insulated unless otherwise noted.

1.03 SUBMITTTALS

A. Submit product data for each system. Product data shall include but not be limited to the following:

1. Manufacturer's name

2. Insulation material and thickness

3. Jacket

4. Adhesives

5. Fastening methods

6. Fitting materials

7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)

9. Other appropriate data

1.04 QUALITY ASSURANCE

A. All ductwork and piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when

tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section must have a minimum of three (3) years' experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with adequate factory-printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

PART 2 PRODUCTS

2.01 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.

2.02 HVAC PIPING:

A. Condensate Drain (Above Ground): Armstrong's "Armaflex AP" pipe insulation, 1/2" thick.

B. Refrigerant

1. Insulate with “Armaflex AP" pipe insulation, 1/2" thick for the following:

a. All Suction Lines.

b. Mixed Phase lines for ductless split systems.

c. Suction and Liquid lines for dedicated 100% outside air split systems.

2.03 MANUFACTURERS

A. CertainTeed Corporation.

B. Johns Manville Corporation.

C. Knauf Corporation.

D. Owens-Corning.

E. Unifrax 1 LLC (FyreWrap).

F. Armacell

2.04 INSULATION MATERIALS

A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

C. Type D3: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable acrylic surface coating specifically formulated to:

1. Be no more corrosive than sterile cotton when tested in accordance with the test method for corrosiveness in ASTM C665.

2. Absorb no more than 3 percent by weight when tested in accordance with the test method for moisture vapor sorption in ASTM C1104.

3. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM C1071, ASTM C1338, ASTM G21, and ASTM G22.

4. Show no signs of warpage, cracking, delaminating, flaming, smoking, glowing, or any other visibly negative changes when tested in accordance with the test method for temperature resistance in ASTM C411.

5. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

6. Meet the sound absorption requirements when tested in accordance with the test method for sound absorption in ASTM C423.

7. Show no evidence of continued erosion, cracking, flaking, peeling, or delamination when tested in accordance with the test method for erosion resistance in UL181.

D. Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000 degrees F; aluminum foil laminated on both sides; with a minimum 'k' value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.

E. Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); 1 inch thick material that has a service temperature range from –60 degrees F to 180 degrees F. This outdoor duct insulation meets ASTM C 177 or C 518 and shall have minimum 'k' value of 0.27 Btu-in. / hr-ft2- degrees F at minimum density measurement of 3 lb/cu ft. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:

1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.

2. Have aflame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

F. Type D6: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable polyacrylate copolymer emulsion specifically formulated to:

1. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM D 5590 with "0" growth rating.

2. Act as a fungicidal protective coating: water based, VOC < 50 g/l. Fungicidal coating must be EPA registered for use in HVAC duct systems. Manufacturer: H.B. Fuller Construction Products Inc., Foster 40-20 (white) or 40-30 (black) Fungicidal Protective Coating or approved equal. Coatings may also be used to repair damage to duct liner insulation.

G. High Density Duct Insulation Insert, see Type D2.

2.05 INSULATION ACCESSORIES

A. Adhesives: Waterproof vapor barrier type, meeting requirements of ASTM C916; Childers CP-82 or Foster 85-20/85-60.

B. Weather Barrier: Breather Mastic: Childers CP-10/CP-11 or Foster 46-50 White.

C. Vapor Barrier Coating: Permeance - ASTM E 96, Procedure B, 0.08 perm or less at 45-mil dry film thickness, tested at 100F and 50%RH; Foster 30-65 or Childers CP-34

1. When higher humidity levels may be of concern, only specify the following fungus/mold resistant coating: Foster 30-80 AF (anti-fungal). Coating must meet ASTM D 5590 with 0 growth rating**

D. Reinforcing Mesh: 10x10 or 9x8 glass mesh; Foster Mast a Fab or Childers #10

E. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.

F. Type D4 Insulation Adhesive: Fire resistive to ASTM E84, Childers CP-82 or Foster 85-20.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Joint Tape: Glass fiber cloth, open mesh.

I. Tie Wire and Wire Mesh: Annealed steel, 16 gage.

J. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.

K. Armaflex 520, 520 BLV, or Foster 85-75 contact adhesive.

L. Armatuff 25 white seal seam tape.

PART 3 EXECUTION

3.01 GENERAL

A. The application of all insulation shall be performed by experienced mechanics, regularly employed in the trade, in a neat and workmanlike manner. Unless otherwise specified to a greater quality, the application of all insulation shall be in accordance with the manufacturer's recommendations.

B. Omit insulation from the following items:

1. Exposed plated plumbing pipe.

2. Vents to atmosphere, discharge from safety and relief valves, overflow pipes, and hot only drain pipes.

3. Valves, unions, flanges, traps, strainers, and devices in HOT ONLY piping.

C. Foil-Faced (FF) Duct Insulation shall comply with NFPA Standards 90A and 90B.

D. All exposed ends of pipe insulation shall be pointed up neatly with appropriate insulating cement, or use pre-molded PVC end caps on cold only piping and preformed aluminum end caps on dual-temp, hot or steam piping.

E. Provide high density insert at duct hangers. Maintain vapor barrier between insulation and duct hanger. Do not insulate duct hangers or supports.

3.02 DUCT AND PIPE PREPARATION

A. Verify that piping and ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

C. Maintain required ambient temperature during and after installation for a minimum period of 24 hours.

3.03 ARMAFLEX PIPE INSULATION

A. Apply in strict accordance with latest edition of Armstrong's "Installation Instructions to the Contractor". Joints and seams shall be sealed moisture tight without gaps and openings in the insulation

3.04 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. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with UL181B-FX listed polypropylene duct tape Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.

E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:

1. Secure flexible insulation jacket joints with vapor barrier adhesive, tape. Tape shall be UL181B-FX listed polypropylene duct tape.

2. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.

4. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.

5. Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.

F. Duct Liner (Type D3 or D6) application for interior of return air sound boots or return air plenums:

1. Secure insulation with 100 percent coverage of duct liner adhesive, pins and clips not more than 18 inches on center.

2. Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.

3. For round duct, secure insulation with 100 percent coverage of duct liner adhesive. Secure cladding with 3/4 inch, 0.020 inch stainless steel bands on 12-inch centers.

4. For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.

5. Type D6: Provide fungicidal coating in air handlers ten feet on either side, first ten feet downstream of cooling coils, ten feet downstream of mix boxes, in mechanical rooms or as otherwise specified in potentially high humidity areas in the duct system shall be coated with an fungicidal coating; EPA registered for use in HVAC duct systems at a coverage rate of 80 ft2/gallon.

G. Insulation (Type D4) application for exterior of grease ducts:

1. External duct wrap system requires two (2) 1.5-inch layers of lightweight, flexible wrap overlapped to provide an effective fire barrier. The barrier is installed in 24-inch or 48-inch wide sections. Insulation pins are welded in certain locations to maintain the fire barrier material up against the duct.

2. Grease duct doors to be installed so the door can be removed and re installed and meet code requirements.

3. Install duct wrap as tested per manufacturer's instructions to assure the duct wrap is mechanically attached per the manufacturer's spacing of bands or weld pins.

4. Vertical and horizontal members of the support hanger system shall be wrapped with one layer of the insulation. Vertical and horizontal portions shall be wrapped independent of one another. The horizontal hanger shall be removed from the

vertical support rods and wrapped and then immediately replaced so that an adjacent horizontal support can be removed, wrapped, and reinstalled. The end of the threaded vertical rod shall extend 6-inch past the horizontal member at the beginning of the installation.

5. Penetrations: Where ducts penetrate fire rated walls, floors and roofs, the duct wrap shall be used in conjunction with a firestop system that is listed by a nationally recognized laboratory and rated for penetration of a rated wall or floor by the fire rated grease duct system used.

H. Insulation (Type D5) application for outdoor ducts:

1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.

2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.

I. All ductwork, accessories, and all plenums including metal and masonry construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

J. Flexible ductwork connections to equipment shall not be insulated.

K. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

L. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

M. Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste. Use only anti-fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-36AF, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire retardant weather barrier mastic.

N. All supply ductwork in the Project shall be insulated; all exhaust and fume hood exhaust ductwork shall not be insulated, unless used for energy recovery purposes or noted on drawings.

O. Flexible round ducts shall be factory insulated.

3.05 INSPECTION

A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

B. Where there is evidence of vapor barrier failure or "wet" insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.06 DUCTWORK INSULATION APPLICATION AND THICKNESS SCHEDULE

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	1-1/2"
Return Air, Relief Air, and Exhaust Air	All	D1	1"
Outside Air	Treated and Untreated	D1	2"
Kitchen Grease Hood Exhaust Air	All	D4	3"
Duct mounted coils	Inside of Mechanical Rooms	D2	2"
Terminal Unit Heating Coils	All	D1	2"
Supply Air Diffusers	Top of Diffuser	D1	2"
Supply Air Duct	Outdoor Environment	D5	2"
Return, Exhaust Air Duct	Outdoor Environment	D5	1-1/2"
Return Air Sound Boots/Elbows/Return Air Plenums	All	D6	1"

END OF SECTION 23 0160

SECTION 230541 STANDARD PACKAGED AIR HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Package roof top unit.

B. Heat exchanger.

C. Refrigeration components.

D. Unit operating controls.

E. Roof curb.

F. Electrical power connections.

G. Operation and maintenance service.

1.02 REFERENCES

A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems. (all)

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration. (all)

C. AHRI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard. (g/e, c/e above 135,000 btuh)

D. AHRI 340 - Commercial and Industrial Unitary Heat pump Equipment.(hp above 135,000 btuh)

E. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment. (all)

F. ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

G. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

H. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California. (all)

I. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment. (all under 135,000 btuh)

J. AHRI 270 - Sound Rating of Outdoor Unitary Equipment. (all below 135,000)

K. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.(all above 135,000 Btuh)

L. ANSI/NFPA 70-1995 - National Electric Code. (all)

1.03 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

E. Shop drawings submitted for approval shall be accompanied by a copy of the purchase agreement between the Contractor and an authorized service representative of the manufacturer for check, test and start up and first year service.

1.04 DELIVERY, STORAGE and HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Leave factory-shipping covers in place until installation.

1.05 WARRANTY

A. Provide parts warranty (excluding refrigerant) for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide five-year extended warranty for compressors.

C. Provide five-year heat exchanger limited warranty.

1.06 REGULATORY REQUIREMENTS

A. Unit shall conform to UL1995 for construction of packaged air conditioner UL_1995

1. In the event the unit is not UL approved, the manufacturer must, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.07 EXTRA MATERIALS

A. Provide one set of filters.

B. Furnish a complete set of fan motor drive belts.

PART 2 PRODUCTS

2.01 SUMMARY

A. The contractor shall furnish and install package rooftop unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS

1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated include but shall not be limited to the following:

    a. Tempmaster

    b. Trane

    c. Carrier

2.02 GENERAL UNIT DESCRIPTION

A. Unit(s) furnished and installed shall be packaged rooftop (s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on AHRI Standard, Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls.

B. Unit(s) shall be 100% factory run tested and fully charged with R-454B.

C. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

D. Units shall be convertible airflow design as manufactured.

E. Wiring internal to the unit shall be colored and numbered for identification.

2.03 UNIT CASING

A. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable access panels. Structural members shall be 18 gauge with access doors and removable panels of minimum 20 gauge.

B. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM

B117.

C. Cabinet construction shall allow for all service/ maintenance from one side of the unit.

D. Cabinet top cover shall be one piece construction or where seams exits, it shall be double-hemmed and gasket-sealed.

E. Access Panels: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.

F. Units base pan shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity.

G. Insulation: Provide 1/2 inch thick fiberglass insulation with foil face on all exterior panels in contact with the return and conditioned air stream. All edges must be captured so that there is no insulation exposed in the air stream.

H. Provide openings either on side of unit or through the base for power, control, condensate, and gas connections.

I. The base of the unit shall have 3 sides for forklift provisions. The base of the units shall have rigging/lifting holes for crane maneuvering.

2.04 AIR FILTERS

A. Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. One-inch thick glass fiber disposable media filters shall be provided with the provisions within the unit for 2 inch thick filters to be field- provided and installed.

2.05 FANS AND MOTORS

A. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.

B. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.

C. Provide units 5 tons and below with direct drive, multiple speed, dynamically balanced supply fans.

D. Provide units 6 tons and above with belt driven, supply fans with adjustable motor sheaves.

E. Outdoor and Indoor Fan motors shall be permanently lubricated and have internal thermal overload protection.

F. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

G. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and

protectively coated with lubricating oil.

2.06 ELECTRIC HEATING SECTION

A. Provide heavy duty nickel chromium heating elements internally wired. Heater shall have pilot duty or automatic reset line voltage limit controls and any circuit carrying more than 48 amps shall have fuse protection in compliance with N.E.C.

B. Heater shall be internal to unit cabinet.

C. Heater shall be UL and CSA listed and approved and provide single point power connection.

2.07 EVAPORATOR COIL

A. Provide configured aluminum fin surface mechanically bonded to copper tubing coil.

B. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 450 psig and leak tested at 200 psig.

C. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

2.08 CONDENSER SECTION

A. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

2.09 REFRIGERATION SYSTEM

A. Compressor(s): Provide direct-drive hermetic, reciprocating type compressor(s) with centrifugal oil pump providing positive lubrication to moving parts and automotive type pistons, rings to prevent gas leakage, internal suction and discharge valves and crankcase heater. Motor shall be suction gas-cooled with internal temperature and current sensitive motor overloads. Internally isolated motors on springs.

2.10 OUTDOOR AIR SECTION

A. Provide 100% return air.

B. Provide economizer with barometric relief.

C. Provide adjustable minimum position control located in the economizer section of the unit.

D. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

2.11 OPERATING CONTROLS

A. Provide factory-wired roof top units with 24-volt electro-mechanical control circuit with control transformers, contactors pressure lugs or terminal block for power wiring. Contractor to provide [DISCONNECT DEVICE]. Units shall have single point power connection as standard. Field wiring of zone controls to be NEC Class II.

2.12 STAGING CONTROLS

A. Provide programmable electronic microcomputer based zone control.

1. Zone control shall incorporate:

a. Automatic changeover from heating to cooling.
b. Set-up for at least 2 - sets of separate heating and cooling temperatures per day.
c. Instant override of setpoint for continuous or timed period from one hour to 31 days.
d. Switch selection features including Fahrenheit display, 12 or 24-hour clock, keyboard disable, remote sensor, fan on-auto.
e. Smart Fan Operation: Allows the unit fan operation to default to the Auto Mode during unoccupied periods, regardless of the Fan switch position.
f. Economizer Minimum Position Override: Allows the unit controller to override and close the minimum position setting on the economizer damper during unoccupied time periods.

2. Zone sensor display shall be capable of:

a. Time of day.
b. Actual room temperature.
c. Programmed temperature.
d. Programmed time.
e. Duration of timed override.
f. Day of week.
g. System mode indication: heating, cooling, low battery, and fan on.

B. Provide remote temperature sensor capability.Provide mixed air sensor in supply air to close outside air damper.

2.13 ROOF CURB

A. Contractor shall provide factory supplied roof curb, 16 gauge perimeter made of zinc coated steel with supply and return air gasketing and wood nailer strips. Ship knocked down and provided with instructions for easy assembly.

B. Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall verify that roof is ready to receive work and opening dimensions are verified.

B. Contractor shall verify that proper power supply is available.

3.02 INSTALLATION

A. Contractor shall install in accordance with manufacturer's instructions.

B. Mount units on factory-built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 MANUFACTURER'S FIELD SERVICES

A. The contractor shall furnish manufacturer complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

END OF SECTION

SECTION 23 06 00 – SPECIALIZED PACKAGED AIR HANDLING UNITS

PART 1 -GENERAL

1.01. GENERAL DESCRIPTION

A. This section includes the design, controls and installation requirements for packaged rooftop units/heat pumps/outdoor air handling units.

1.02. QUALITY ASSURANCE

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.

B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

D. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.

E. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

F. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

G. Unit Seasonal Energy Efficiency Ratio (SEER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

H. Unit shall comply with Chicago code requirements for an HVAC unit with cooling and gas heat.

I. Unit shall comply with Chicago code requirements for an HVAC unit with cooling and gas heat.

J. Unit shall comply with Chicago code requirements for an HVAC unit with cooling and electric heat.

K. Unit shall comply with Chicago code requirements for an HVAC unit with cooling and electric heat.

L. Unit shall comply with Chicago code requirements for an HVAC unit with cooling.

M. Unit shall comply with Chicago code requirements for an HVAC unit with cooling.

N. Unit shall comply with Chicago code requirements for an HVAC unit with gas heat.

O. Unit shall comply with Chicago code requirements for an HVAC unit with gas heat.

P. Unit shall comply with Chicago code requirements for an HVAC unit with electric heat.

Q. Unit shall comply with Chicago code requirements for an HVAC unit with electric heat.

R. Unit shall comply with Chicago code requirements for an HVAC unit without heating or DX cooling.

S. Unit shall comply with Chicago code requirements for an HVAC unit without heating or DX cooling.

T. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

U. Unit shall be certified by ETL and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label. The nameplate, safety labels and warnings will be in English and French.

V. Unit shall be preapproved for California Office of Statewide Health Planning and Development (OSHPD) special seismic certification (OSP-0180-10).

W. Unit shall be IBC 2009/2012 seismically certified. Unit shall be certified through seismic analysis and shake testing in accordance with ASCE-7-05/7-10 and ICC-ES AC-156.

X. Unit cabinet construction shall be designed and manufactured to meet IBC 2009/2012 seismic standards.

1.03. SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.04. DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors bolted shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.05. WARRANTY

A. Manufacturer shall provide a limited “parts only” warranty for a period of 24 months from the date of original equipment shipment from the factory. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

B. Manufacturer shall provide a limited “parts only” warranty for a period of 60 months from the date of original equipment shipment from the factory. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

C. Manufacturer shall provide a limited “parts only” warranty for a period of 120 months from the date of original equipment shipment from the factory. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

1.06. STARTUP REPAIR PROGRAM

A. Manufacturer shall provide startup repair for a period of 12 months from the date of original equipment shipment from the factory. Program shall cover labor for materials and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Program excludes labor associated with routine maintenance, such as belt and air filter replacement.

PART 2 - PRODUCTS

2.01. MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON, Daikin, Valent, Greenheck, or approved equal.

2. Substitute equipment may be considered for approval that includes at a minimum:

   a. R-454B refrigerant

   b. Direct drive supply fans

   c. Double wall cabinet construction

   d. Insulation with a minimum R-value of 13

   e. Stainless steel drain pans

   f. Hinged access doors with lockable handles

   g. Variable capacity compressor with 10-100% capacity

   h. Inverter driven variable speed compressor

   i. Two-stage compressor with capacities of 100% and 67%

   j. VFD controlled variable speed compressor

   k. All other provisions of the specifications must be satisfactorily addressed

2.02. ROOFTOP UNITS

A. General Description

1. Packaged rooftop unit shall include compressor, evaporator coil, filters, supply fan, dampers, air-cooled condenser coils, condenser fan, water-cooled condenser, reheat coil, gas heater, electric heater, hot water coil, steam coil, exhaust fan, energy recovery wheel, fixed plate heat exchanger, and unit controls.

2. Outdoor air handling unit shall include filters, supply fan, dampers, chilled water coil, DX evaporator coil, gas heater, electric heater, hot water coil, steam coil, exhaust fan, energy recovery wheel, fixed plate heat exchanger, and unit controls.

3. Unit shall be factory assembled and tested including leak testing of the chilled water coils, leak testing of the DX coils, leak testing of the steam coils, leak testing of the hot water coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment’s literature pocket.

4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

5. Unit components shall be labeled, including pipe stub outs, pipe stub outs, refrigeration system components and electrical and controls components.

6. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.

7. Installation, Operation and Maintenance manual shall be supplied within the unit.

8. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.

9. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

10. Unit shall be crated for overseas shipment. Crate shall be fabricated from blocked, braced, and banded dimensional lumber and plywood.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, reduces heat transfer through the panel, and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 210/240.Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

6. Access to filters, dampers, cooling coil, reheat coil, heater, heating coil, energy recovery wheel, fixed plate heat exchanger, compressor, water-cooled condenser, and electrical and controls components shall be through hinged access doors with quarter turn, lockable handles. Full length stainless steel piano hinges shall be included on the doors.

7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

8. Units shall include double sloped 304 stainless steel drain pans.

9. Unit shall be provided with through the base vertical discharge and return air openings. All openings through the unit shall have upturned flanges of at least 1/2 inch around the opening.

10. Unit shall include lifting lugs on the top of the unit.

11. Unit base pan shall be provided with 1/2 inch thick foam insulation.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.

2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.

3. Unit shall be provided with factory installed and factory wired circuit breaker.

4. Air-source heat pump shall include a defrost cycle to prevent frost accumulation on the outdoor coil during heat pump heating operation. Defrost cycle shall begin when outdoor coil temperature is below a fixed setpoint and have a fixed 10 minute run time, or end when the outdoor coil temperature is above a fixed setpoint. Defrost timer, with 30/60/90 minute selectable defrost cycle interval time, shall be factory installed in the controls compartment. During defrost cycle all compressors shall energize, reversing valve shall de-energize, and auxiliary heat shall energize.

5. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.

6. Unit shall be provided with a factory installed and field wired 115V, 20 amp GFI outlet in the unit control panel.

7. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

8. Unit shall be provided with manual reset low temperature limit controls which shut off the unit when the discharge temperature reaches a field adjustable setpoint.

9. Unit shall be provided with blower auxiliary contacts on the low voltage terminal block which close when the supply fans are energized.

10. Unit shall be provided with remote stop/start terminals which require contact closure for unit operation. When these contacts are open the low voltage circuit is broken and the unit will not operate.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

2. Blowers and motors shall be dynamically balanced.

3. Motor shall be a high efficiency electrically commutated motor.

4. Motor shall be standard efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points

5. Motor shall include shaft grounding.

E. Cooling Coils

1. Evaporator Coils

a. Coils shall be designed for use with R-454B refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

b. Coil shall be 6 row high capacity

c. Coils shall be helium hydrogen or helium leak tested.

d. Coils shall be furnished with factory installed electronic expansion valves.

e. Coils shall be furnished with factory installed thermostatic expansion valves.

f. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 hours each (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 10,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory. Instructions coil cleaning, maintenance, and recording keeping must be followed. Refer to the unit Installation, Operation and Maintenance Manual.

F. Refrigeration System

1. Unit shall be factory charged with R-454B refrigerant.

2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.

6. Each refrigeration circuit shall be equipped with electronic expansion valve type refrigerant flow control.

7. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed liquid line filter driers.

8. Unit shall include 2 stages of capacity control.

9. Unit shall include a two-stage compressor which shall modulate between two capacity settings, 67% and 100%.

10. Unit shall include factory provided and installed compressor sound jackets on all compressors.

11. Unit shall be configured as an air-source heat pump. Refrigeration circuit shall be equipped with a factory installed liquid line filter drier with check valve, reversing valve, accumulator, and thermal expansion valves on both the indoor and outdoor coils. Reversing valve shall energize during the heat pump cooling mode of operation.

12. Refrigeration circuit shall be equipped with a liquid line sight glass.

13. Refrigeration circuit shall be equipped with suction and discharge compressor isolation valves.

14. Each capacity stage shall be equipped with a 5 minute off delay timer to prevent compressor short cycling.

15. The factory installed controls shall include a 3 minute off delay timer to prevent compressor short cycling and an adjustable compressor lockout.

16. Refrigeration circuit shall be provided with hot gas reheat coil, on/off control valve and a control signal terminal which allow the unit to have a dehumidification mode of operation.

17. Unit shall be provided with an adjustable compressor lockout.

18. Unit shall be provided with a power factor correction capacitor on the compressor. The maximum correction factor is 0.9.

19. Refrigeration circuit shall be equipped with flooded condenser low ambient head pressure control to allow operation down to 0°F. Option includes adjustable on/off condenser fan cycling and an adjustable compressor lockout.

20. Refrigeration circuit shall be provided with an adjustable temperature sensor freeze stat which shuts down the cooling circuit when the evaporator coil tubing falls below the setpoint.

21. Reheat Coil shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 hours each (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 10,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory. Instructions coil cleaning, maintenance, and recording keeping must be followed. Refer to the unit Installation, Operation and Maintenance Manual.

G. Condensers

1. Air-Cooled Condenser

a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.

b. Coils shall be designed for use with R-454B refrigerant.

c. Condenser coils shall be multi-pass and fabricated from aluminum microchannel tubes.

d. Heat pump outdoor coil shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

e. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

f. Coils shall be hydrogen or helium leak tested.

g. Condenser fans shall be high efficiency electrically commutated motor driven with multiple speeds which are controlled with a fan cycle switch based on head pressure and allow matching condenser airflow with cooling capacity steps.

h. Condenser fans shall be high efficiency electrically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

i. Condenser fans shall be low sound, high efficiency electronically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F. Condenser fan housing shall be fabricated of composite material and include an optimized orifice with inlet guide vanes. The condenser fan blade shall be serrated and aerodynamically designed for high efficiency and reduced sound levels.

j. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 hours each (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 10,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory. Instructions coil cleaning, maintenance, and recording keeping must be followed. Refer to the unit Installation, Operation and Maintenance Manual.

H. Electric Heating

1. Unit shall include an electric heater consisting of electric heating coils, fuses and a high temperature limit switch, with capacities as shown on the plans.

2. Auxiliary electric heating capacity shall be sized to meet heating leaving air temperature setpoint when heat pump heating is in operation. Auxiliary heating capacity shall be available for operation when heat pump heating is in operation. Unit shall include 1 stage of auxiliary electric heating capacity.

3. Emergency electric heating capacity shall be sized to meet heating leaving air temperature setpoint when heat pump heating is not in operation. Auxiliary electric heating capacity shall be sized to meet heating leaving air temperature setpoint when heat pump heating is in operation. Unit shall include 1 stage of auxiliary electric heating capacity.

I. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE MERV rating of 13, upstream of the cooling coil.

2. Unit shall include a clogged filter switch.

3. Units shall include a Magnehelic gauge mounted in the controls compartment.

J. Outside Air/Economizer

1. Unit shall include 0-50% adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have nomore than 15 cfm of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Unit shall include outside air opening bird screen, outside air hood with rain lip and a return air connection.

K. Controls

1. Factory Installed and Factory Provided Controller

a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.

b. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

d. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

e. Constant Volume Controller

1. Unit shall modulate cooling with constant airflow to meet space temperature cooling loads.

2. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.

3. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Staged heating capacity shall modulate based on space temperature.

4. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Modulating heating capacity shall modulate based on supply air temperature.

f. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [Orion Controls System]

g. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with a touchscreen controller interface. Controller shall be capable of communicating and integrating with a BACnet MS/TP or Modbus RTU network. [AAON Touchscreen Controller]

1. Standard Terminal Block

a. Unit shall be provided with a terminal block for field installation of controls.

b. Isolation relays shall be factory installed.

L. Accessories

1. Unit shall be provided with a smoke detector sensing the return air of the unit, wired to shut off the unit's control circuit.

2. Unit shall be provided with a smoke detector sensing the supply air of the unit, wired to shut off the unit's control circuit.

3. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector which shuts off the unit's control circuit.

4. Unit shall be provided with a high condensate level switch that shuts down the unit when a high water level is detected in the drain pan

2.03 Curbs

A. Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

PART 3 - EXECUTION

3.01 INSTALLATION, OPERATION AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

SECTION 23 0710 - HVAC SHEET METAL

PART 1 - GENERAL

1.01 SCOPE:

A. All low pressure duct work including supply, exhaust, and outside air to complete the systems as shown on the Drawings or specified herein.

1.02 SUBMITTALS:

A. Submit the following:

1. Air distribution devices.
2. Life safety dampers and doors.
3. Flexible duct.
4. Flexible connections.
5. Access doors and duct access doors.
6. Turning vanes.
7. Duct take-off, fittings.
8. Roof outside air intake.
9. Duct sealants.
10. Duct leak tests.

1.03 GOVERNING PUBLICATIONS AND AUTHORITIES:

A. ASHRAE "Guide".

B. SMACNA "Low Velocity Duct Construction Standards".

C. Underwriters' Laboratories, Inc.

D. NFPA Pamphlets No. 90A, 90B, 91 and 96.

PART 2 - PRODUCTS

2.01 DUCT MATERIALS:

A. Galvanized steel sheets shall be lock-forming quality (LFQ), shall have a galvanized 690 zinc coating of 1-1/4 oz. total for both sides of one square foot, and the gauge of galvanized steel sheets shall be as prescribed by the latest edition of SMACNA for pressure classification of ductwork.

B. Aluminum sheets shall be made from an aluminum base alloy having not more than

0.5% copper (for corrosion resistance), a minimum tensile strength of 16,000 psi and the ability to satisfactorily make a Pittsburgh lock seam without splitting.

2.02 FLEXIBLE CONNECTIONS:

A. Flexible connections shall be made on duct connections of air moving equipment greater than 2000 CFM or as required for equipment installation.

B. Connections shall be made of 30 ounce woven glass fabric; fire-, water-, and weather-resistant fabric equal to “Ventfab”, double coated with neoprene "Ventglas", or equal. Canvas connections to give no less than 3" clear break between metals jointed. Insulate with 1" minimum fiberglass duct wrap with a vapor barrier facing of foil reinforced kraft. Seal with reinforced aluminum tape.

C. Flexible connections on exterior shall be protected from weather with sheetmetal cover which shall be coated for protection same as ductwork.

D. Connections in high pressure systems, fume hoods, and for those exposed to the weather shall be made from "Ventglas", neoprene coated glass fabric.

2.03 ACCESS DOORS:

A. Access doors to 16" by 24" size shall be "Ventlock" stamped insulated access doors.

B. Larger access doors shall be double panel construction with one inch thick 1.5 pcf density rigid insulation between panels. Doors with largest dimension over 24", but less than 48", shall use "Ventlock" series 200 latches, hinges and gasketing, and construction shall be 22 gage galvanized steel. Doors with largest dimension over 48" shall use "Ventlock" series 300 latches, hinges and gasketing, and construction shall be 20 gage galvanized steel.

C. Provide vision panels on access doors for fire dampers and control dampers.

2.04 FLEXIBLE DUCT:

A. Low Pressure: furnish and install, where indicated on the drawings, flexible metal insulated round ductwork, factory fabricated, listed under U.L. #181, Class 1 and NFPA 90A, capable of a minimum centerline bend radius equal to duct inside diameter. Insulation shall be 1-1/2" thick, 3/4 lb. density fiberglass blanket, maximum "K" value of 0.25 btu-in/hr-ft5-EF., and vapor barrier shall be neoprene coated fiberglass fabric laminated to aluminized polyester film. Flexible duct shall be rated for 10" positive and 2" negative static pressure.

B. Vinyl or non- aluminized vapor barriers will <u>not</u> be allowed. Maximum runouts shall not exceed length indicated on drawings in notes or details.

2.05 AIR DISTRIBUTION DEVICES:

A. General:

1. All outlet grilles shall have gaskets.

2. Furnish opposed blade volume controls on all supply outlets and return

grilles.

B. Devices: Devices shall be as scheduled on the drawings.

2.06 LIFE SAFETY DAMPERS:

A. Dampers shall be equal to those manufactured by the Ruskin Corporation or Greenheck.

B. Dampers shall be U.L. listed.

C. Fire, smoke or combination fire/smoke dampers shall be provided in rated assemblies requiring them.

D. All dampers, methods and location of installation shall comply with the requirements of the International Building Code, National Fire Protection Association and all authorities having jurisdiction. In the case of discrepancies, most stringent requirements shall dictate installation.

E. Fire and smoke dampers shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper and its operating parts. Access shall be provided on either side of damper assemblies.

F. Access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly.

G. Provide access door minimum 12" x 12".

H. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch (12.7 mm) in height reading: fire/smoke damper, smoke damper or fire damper.

I. Access doors in ducts shall be tight fitting and suitable for the required duct construction. Contractor shall install dampers in accordance with the following:

J. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Dampers shall have an hourly rating as indicated on the drawings, a 212°F fusible link, and shall include a UL label.

K. All outlet grilles shall have gaskets.

L. Contractor shall furnish opposed blade volume controls on all supply outlets and return grilles.

M. Dampers shall be equipped for vertical or horizontal installation as required by the location.

N. Manufacturer’s integral sleeves and frames may be used at the contractor's option.

O. Dampers shall be provided which are tested and rated for design duct velocity and pressure.

P. Dampers rating shall meet or exceed the rating of the wall in which it is housed.

Q. Contractor shall install fire or smoke or combination dampers in all rated walls as necessary to maintain the integrity of all rated walls whether indicated on the plans or not.

2.07 ACCESSORIES:

A. Manufactured Turning Vanes: Furnish and install single thickness, multiple radius, airfoil steel turning vanes. Static pressure loss for square ducts shall be no more than 20% of velocity head. Turning vanes shall be furnished with a mounting plate to facilitate installation in ductwork.

B. Manual Balancing Damper:

1. Square or Rectangular: Minimum 16 ga. body and 18 ga. blades, equal to Ruskin or Greenheck with vinyl blade seal and locking hand operator quadrant.

2. Round: Minimum 20 ga. body and 22 ga. blades, equal to Ruskin or Greenheck with locking hand operator

C. Control Dampers:

1. Control dampers shall be furnished by AHU Manufacturer or Control System.

D. All dampers shall be capable of 100% seal off.

2.08 KITCHEN EXHAUST DUCTWORK

A. Kitchen hood exhaust duct shall comply with NFPA 96. Ductwork shall be minimum 16 gauge carbon steel. Joints and seams shall be welded. Provide cleanouts in ducts and insulation at changes in direction per NFPA.

B. Kitchen dishwasher hood duct shall be welded 18 Ga. 304 stainless steel. Exposed duct shall have standard mill finish.

PART 3 - EXECUTION

3.01 GENERAL:

A. All ductwork not specifically indicated on drawings or specified elsewhere to be high-pressure duct shall be fabricated, braced and erected in accordance with SMACNA "Low Velocity Duct Construction Standard" or the latest edition of ASHRAE "Guide".

B. Ductwork shall be galvanized steel unless otherwise noted.

C. Stainless steel and aluminum ductwork shall welded seam.

D. Adhere to drawings as closely as possible. However, where required to meet structural or other interferences vary the run and shape of ducts and make offsets during progress of work. Duct routes shall be established and field measurements shall be taken before duct work is fabricated. Where pipes or other items are "taken-in" to the duct, streamline collars shall be formed and placed around the item. If

collar obstructs more than 20% of the cross sectional area, the duct shall be enlarged to accommodate obstruction.

E. All changes of direction and elbows shall be fitted with turning vanes. Standard radius elbows may be used if space permits.

F. Ductwork shall be free of any objectionable self-generating noise or rattles.

G. Furnish and install shop fabricated ductwork. Pre-assemble work in shop to the greatest extent possible, so as to minimize field assembly of systems. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.

H. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

I. Duct Sealing: All ductwork, regardless of system pressure classification, shall be sealed in accordance with Seal Class A, as referenced in SMACNA Standards. All transverse joints, longitudinal seams, and duct wall penetrations shall be sealed.

1. All seams and joints in shop and field fabricated ductwork shall be sealed by applying duct sealant complying with manufacturer's recommendations. Tapes recommended by the sealant manufacturer may used in addition to sealant to achieve leakage limit requirements.

2. Sealant shall be water based latex UL 181A-M sealant with flame spread of 0 and smoke developed of 0. Sealants shall be Hard Cast Iron Grip 601, Ductmate Pro Seal, Foster 32-19, Childers CP-146 or Design Polymerics DP 1010.

3. Sealing tapes shall be from the same manufacturer as duct sealants.

4. Sealer shall be rated by the manufacturer and shall be suitable for use at the system pressure classification of applicable ductwork.

5. Except as noted, oil or solvent-based sealants are specifically prohibited.

6. For exterior applications, "Uni-Weather" (United McGill Corporation), solvent-based sealant, or Foster 32-19 shall be used.

J. Support materials shall be hot dipped galvanized steel fasteners, anchors, rods, straps, trim and angles. (Support duct with all thread rods and unistrut as equal trapeze hangers).

K. Install air flow measuring stations, furnished by Control Contractor, where indicated on the drawings.

3.02 MANUAL BALANCING DAMPERS:

A. All low pressure branch ducts on either supply, return or exhaust shall be provided by some means of balancing in addition to dampers at registers.

B. Splitter dampers shall be made of at least the same thickness material as duct

(minimum thickness 22 gage). They shall be securely hinged at air leaving edge and made of 2 thicknesses so that entering edge presents a rounded surface to air flow.

C. Butterfly dampers shall be made of 16 gage galvanized steel. Butterfly dampers may be used in widths up to 10" wide. Dampers that require blades over 10" wide shall be multi-blade louver dampers.

D. Multi-blade louver dampers used for balancing shall be of the opposed blade type. Damper blades shall be constructed of 16 gage steel. Individual blade width shall not exceed 10" and blade length shall not exceed 48".

E. All dampers shall be so constructed and installed that there shall be no vibration due to air flow over damper.

F. Extend all handles and levers to outside of insulation.

3.03 ACCESS DOOR:

A. Access doors shall be provided at all dampers, equipment in duct and as indicated on drawings.

B. Access doors shall be minimum of 12" X 12" unless a larger size is required for maintenance of equipment or a smaller size must be used because of small duct size.

C. Provide access doors at all fire dampers, smoke dampers, humidifiers, and as indicated on the drawings.

3.04 FLEXIBLE CONNECTIONS:

A. Furnish and install sound isolating flexible connections on the inlet and outlet of each fan and unit to which duct connectors are made.

B. At least one inch slack shall be allowed in these connections to insure that no vibration is transmitted from fan to ductwork.

C. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

3.05 FLEXIBLE DUCT

A. Maximum runout shall not exceed lengths indicated on drawings.

B. Ducts shall be supported at intervals indicated in SMACNA and not laid on top of ceiling.

C. Minimum bend radius shall be as recommended by manufacturer.

D. Ducts shall be run straight and true with minimum offsets, and with excess duct lengths removed.

E. Connections to ducts and air devices shall be with minimum of one duct diameter straight into connection (kinked or pinched installations restricting flows are not acceptable).

F. Connections to duct and air devices shall be air tight.

3.06 TESTS:

A. Test duct systems in accordance with SMACNA latest edition of HVAC Air Duct Leakage Test Manual to achieve air tight systems not exceeding the limits outlined in the manual. Submit test results.

END OF SECTION

SECTION 23 0990 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities and temperatures of the mechanical systems as required to meet design specifications, and recording and reporting the results.

1. Test, adjust, and balance the following mechanical systems:

a. Supply air systems, all pressure ranges.

b. Return air systems.

c. Exhaust air systems.

d. Outside air systems.

e. Verify control system operation.

f. Hydronics systems.

2. Contractor shall:

a. Put heating, ventilating, and air conditioning systems and equipment into full operation and continue the operation of same during each working day of testing and balancing.

b. Allow the air balance agency to schedule this work in cooperation with other trades involved and comply with the completion date.

c. Make available to the balance agency a complete copy of submittal data on mechanical equipment including pump performance curves, fan curves, manufacturer's balancing factors and other manufacturers ratings for installed equipment.

d. Make any changes in pulleys, belts, and dampers or the addition of dampers as required for correct balance as recommended by TAB Contractor, at no additional cost to the Owner.

e. Have strainers and filters clean prior to starting of testing and balancing activity.

B. This section does not include:

1. Specifications for materials for patching mechanical systems.

2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

3. Requirements and procedures for piping and ductwork systems leakage tests.

1.02 DEFINITIONS:

A. Systems testing, adjusting, and balancing is the process of checking and adjusting building environmental systems to produce design objectives. It includes:

1. Balance of air distribution;

2. Adjustment of total system to provide design qualities;

3. Electrical measurement;

4. Verification of performance of equipment and automatic controls;

B. Test: To determine quantitative performance of equipment.

C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttTo proportion flows within the distribution system (mains, branches, and terminals) according to specified design quantities.

D. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting and balancing.

E. Terminal: The point where controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

1.03 SUBMITTALS:

A. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

B. Technicians Data: Submit proof that the Test and Balance Staff assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems.

E. Sample Forms: Submit sample forms.

F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Technician. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.

G. Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

H. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports.

I. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide contents of binder into the below listed divisions, separated by divider tabs:

1. General Information and Summary

2. Air Systems

3. Hydronic Systems

4. Temperature Control Systems

J. Report Contents: Provide the following minimum information, forms and data:

1. General Information And Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor and Project. Include addresses, and contact names and telephone numbers. Also include a sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Technician. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

2. The remainder of the report shall contain the appropriate forms for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

3. Air systems report shall include the following:

a. blower RPM;

b. motor full load amperes and voltages; system static pressures, suction and discharge;

c. cfm outside air (for demand controlled ventilation with CO2 sensors, provide airflow readings at 2 different CO2 levels;

d. entering air temperatures; DB/WB

e. leaving air temperatures; DB/WB

f. main supply, return, and exhaust air ducts cfm, (pitot transverse);

g. each diffuser, grille and register cfm. (Balance to within +/-10% of design requirements and pressure relationships shown on drawings.)

h. each grille, diffuser, and register shall be identified as to location and area;

i. copies of start-up logs;

j. space temperatures and humidity readings; DB/WB

k. pressure drops across coils, filters, dampers, and other equipment in ducts.

l. pressure profiles of each system.

m. sheave size, brand name, and number.

n. belt quantity, stock name, and number.

K. Calibration Reports: Submit proof that required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of 6 months prior to starting the project.

1.04 QUALITY ASSURANCE:

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

2. The independent testing, adjusting, and balancing agency shall be certified by National Environmental Balancing Bureaus (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one Technician, certified by NEBB or AABC.

B. B. Codes and Standards:

1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".

2. AABC: "National Standards for Total System Balance".

3. ASHRAE: ASHRAE Handbook, Current Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

C. Pre-Balancing Conference: Prior to beginning testing, adjusting, and balancing procedures, schedule and conduct a conference with the Contracting Officer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.05 PROJECT CONDITIONS:

A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.06 ACCEPTANCE:
The Contracting Officer will not accept the building until the systems have been properly started, balanced, and the TAB Report is approved.

PART 2 - PRODUCTS: NOT USED

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:
Before operating the system, perform these steps:

A. Obtain design drawings and specifications and become thoroughly acquainted with design intent.

B. Obtain copies of approved shop drawings of air handling equipment, outlets (supply and return) and temperature control diagrams.

C. Compare design to installed equipment and field installations.

D. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.

E. Check filters for cleanliness.

F. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.

G. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

H. Determine best locations in main and branch ductwork for most accurate duct traverses.

I. Place outlet dampers in full open position.

J. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

K. Verify that motors and bearings have been lubricated.

L. Check fan belt tension.

M. Check fan rotation.

3.02 3.03 MEASUREMENTS:

A. A. Provide required instrumentation to obtain proper measurements, calibrated to the tolerances specified in referenced standards. Instruments shall be properly maintained and protected against damage.

B. B. Provide instruments meeting the specifications of the referenced standards.

C. C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. D. Apply instrument as recommended by the manufacturer.

E. E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

3.03 PERFORMING TESTING, ADJUSTING, AND BALANCING:

A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

B. extent necessary to allow adequate performance of procedures.

C. Patch insulation, ductwork, and housings, using materials identical to those removed.

D. Seal ducts and piping, and test for and repair leaks.

E. Seal insulation to re-establish integrity of the vapor barrier.

F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar control and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.04 RECORD AND REPORT DATA:

A. Record data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by referenced standards, and as approved on sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.05 DEMONSTRATION:

A. Training:

1. Train maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with personnel the information contained in Operating and Maintenance Data.

2. Schedule training through the Owner with at least 7 days' prior notice.

END OF SECTION

SECTION 260000 - ELECTRICAL - GENERAL PROVISIONS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials and equipment required and install complete and make operational, electrical system as shown on the Drawings and as specified herein.

B. The work shall include the following:

1. Coordinate the electrical service requirements with the power company and provide the electrical service(s) from the Power Company at the locations indicated.

2. Provide conduit, wire and field connections for all equipment, HVAC systems, panelboards, transformers, and electrical equipment furnished under Divisions 1, 11, 21, 22, 23, and 26.

C. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this sub-bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that their representative has visited the buildings and structures and noted the locations and conditions under which the work will be performed and that he/she takes full responsibility for a complete knowledge of all factors governing his/her work.

2.1 SUBMITTALS

A. As a minimum all equipment specified in each Section of Division 26 shall be submitted at one time. As an example all lighting fixtures shall be submitted together, all motor control centers shall be submitted together, etc. Submittals that do not comply will be returned disapproved.

B. Mark submittals to clearly identify proposed equipment including accessories, options, and features and to exclude parts not applicable to the project. When manufacturer’s cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submittal piece of literature and each submittal drawing shall clearly reference the Project Specification and/or Contract Drawing that the submittal is to cover. General catalogs will not be accepted as cut sheets to fulfill submittal requirements.

C. Check shop drawings for accuracy prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to this Section and the Drawings. This statement shall also list all exceptions to this Section and the Drawings. Mark submittals to identify proposed equipment including accessories, options and features being proposed for approval and exclude parts not to be used. Shop drawings not so checked and noted shall be returned marked NOT APPROVED.

D. The Engineer's check shall be for conformance with the design concept of the project and compliance with this Section and the Drawings. Errors and omissions on approved shop

drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by this Section and the Drawings.

E. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.

F. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked “APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."

G. Operation and Maintenance Data

1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 017823. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists including replacement part numbers, to instruct operating and maintenance personnel unfamiliar with such equipment.

2. Manuals shall include the following as a minimum:

a. A complete "As-Built" set of approved shop drawings.

b. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.

c. Detailed service, maintenance and operation instructions for each item supplied.

H. Exceptions for Submittals

1. Exceptions to the Specifications or Drawings shall be clearly defined by the Electrical Subcontractor in a separate section of each submittal package. The submittal shall contain the reason for the exception, the exact nature of the exception and the proposed substitution so that a proper evaluation may be made by the Engineer. The acceptability of any device or methodology submitted as an “or equal” or “exception” to the Specifications shall be at the sole discretion of the Engineer.

I. Submittals will be returned to the Contractor under one of the following codes.

Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

Code 2 - "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/CONFIRM" - This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. The Contractor may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically

address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 10 calendar days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 - "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the resubmittal.

Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Contractor.

Code 7 - "RECEIPT ACKNOWLEDGED" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer’s review and approval; and, is being filed for informational purposes only. This code is generally used in acknowledging receipt of *means and methods of construction* work plan, field conformance test reports, and Health and Safety plans.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

3.1 REFERENCE STANDARDS

A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC).

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

4.1 PRIORITY OF THE CONTRACT DOCUMENTS

A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

C. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.

D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.

E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times

5.1 SERVICE AND METERING

A. Service will be obtained at 208 Volts, 3Phase, 4Wire, 60 Hz.

B. The Contractor shall be responsible for the following work:

1. Obtain an estimate from the power company for the work described above and include the cost of the power company work in the Bid Price.

2. Make all arrangements with the power company for obtaining electrical service, pay all power company charges.

6.1 CODES, INSPECTION AND FEES

A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.

B. Obtain all necessary permits and pay all fees required for permits and inspections.

7.1 INTERPRETATION OF DRAWINGS

A. Unless specifically stated to the contrary, the Drawings do not show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.

B. Install each 3 phase circuit in a separate conduit unless otherwise shown on the Drawings.

C. Conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed. Unless otherwise indicated install branch circuit conduits exposed in process/ industrial type spaces and concealed in finished spaces.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner.

E. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

F. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials to install and place in satisfactory operation all power, lighting and other electrical systems shown.

H. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

I. Raceways and conductors for low voltage (120 Volts) thermostats controlling HVAC unit heaters, exhaust fans and similar equipment are not shown on the Drawings. Provide raceways and conductors between the thermostats, the HVAC equipment and the motor starters for a complete and operating system. Raceways shall be installed concealed in all finished space and may be installed concealed or exposed in process spaces. Refer to the HVAC drawings for the locations of the thermostats.

8.1 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which electrical equipment furnished under Division 26 must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

9.1 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called the "Record Drawings."

10.1 MATERIALS AND EQUIPMENT

A. Materials and equipment furnished under this contract shall be new.

B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

11.1 EQUIPMENT IDENTIFICATION

A. Identify equipment, disconnect switches, separately mounted motor starters, control stations, etc. furnished under Division 26 with the name of the equipment it serves. Motor control centers, control panels, panelboards, switchboards, switchgear, junction or terminal boxes, transfer switches, etc, shall have nameplate designations as shown on the Drawings.

B. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick by 3/4-in by 2-1/2-in with 3/16-in high white letters on a black background.

C. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

PART 2 EXECUTION

1.1 INSTALLATION

A. Work not installed according to the Drawings and Specification shall be subject to change as directed by the Engineer at Contractor's expense.

B. Electrical equipment shall be protected against mechanical and water damage. Store all electrical equipment in dry permanent shelters. Do not install electrical equipment in place until structures are weather-tight.

C. Damaged equipment shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion and at the Contractor's expense.

D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer.

2.1 WORK SUPERVISION

A. The Contractor shall designate in writing the qualified electrical supervisor who shall provide supervision to all electrical work on this project. The minimum qualifications for the electrical supervisor shall be a master electrician as defined by the Arkansas Board of Electrical Examiners. The supervisor or his appointed alternate possessing at least a journeyman electrician license shall be on site whenever electrical work is being performed. The qualifications of the electrical supervisor shall be subject to approval of the Owner and the Engineer.

B. All master and journeyman electricians shall be licensed in accordance with Arkansas Code Title 17 Chapter 28 - Electricians. The website located at http://www.arkleg.state.ar.us publishes the text of this statutory requirement. No unlicensed electrical workers shall perform work on this project. Apprentice electricians in a ratio of not more than one apprentice per journeyman electrician will be allowed if the apprentices are licensed and actively participating in an apprenticeship program recognized and approved by the Arkansas Board of Electrical Examiners.

END OF SECTION 260000

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
2. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cerro Wire LLC.
2. General Cable Technologies Corporation.
3. Okonite Company (The).
4. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type NM: Comply with UL 83 and UL 719.
2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type THHN and Type THWN-2: Comply with UL 83.
5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
6. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

B. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Feeders in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. O-Z/Gedney; a brand of Emerson Industrial Automation.
3. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

A. Conductors shall be as specified under Section 260519 “Low-Voltage Electrical Power Conductors and Cables.”

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

J. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, **No. 4/0** AWG minimum.

1. Bury at least 24 inches below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes;

use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: 1-5/8 inches.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101

B. Comply with requirements in "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS SP-58,Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allied Tube & Conduit; a part of Atkore International.
b. Republic Conduit.
c. Thomas & Betts Corporation; A Member of the ABB Group.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

a. Comply with NEMA RN 1.
b. Coating Thickness: 0.040 inch, minimum.

6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Allied Tube & Conduit; a part of Atkore International.
   b. Republic Conduit.
   c. Thomas & Betts Corporation; A Member of the ABB Group.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:

   a. Material: Steel.
   b. Type: Compression.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CANTEX INC.
   b. RACO; Hubbell.
   c. Thomas & Betts Corporation; A Member of the ABB Group.

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

C. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CANTEX INC.
   b. RACO; Hubbell.
   c. Thomas & Betts Corporation; A Member of the ABB Group.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.

3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Fittings for LFNC: Comply with UL 514B.
5. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 based on installation location, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crouse-Hinds, an Eaton business.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Hubbell Incorporated; Wiring Device-Kellems.
4. Thomas & Betts Corporation; A Member of the ABB Group.
5. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

L. Gangable boxes are prohibited.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.

4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Electrical rooms
    e. Gymnasiums.

2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
4. Damp or Wet Locations: GRC.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

H. Panel feeders shall not be installed on roofs unless specifically noted on plans or approve via RFI to engineer.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Raceways installed on roof shall be kept a minimum of 1” above roof deck and shall be supported using Dura-Blok rooftop supports with maximum spacing of 10’ between supports.

D. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

E. Do not fasten conduits onto the bottom side of a metal deck roof.

F. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

G. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

J. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

K. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

L. Support conduit within 12 inchesof enclosures to which attached.

M. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC before rising above floor.

N. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

U. Mount boxes at heights indicated on Drawings or in Specification 262726 “Wiring Devices”. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

X. Locate boxes so that cover or plate will not span different building finishes.

Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

AA. Set metal floor boxes level and flush with finished floor surface.

BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified.
3. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Tapes and stencils.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

2. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

3. Color for Neutral: White.
4. Color for Equipment Grounds: Green.
5. Colors for Isolated Grounds: Green with white stripe.

B. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

C. Equipment Identification Labels:

1. Black letters on a white field.

2.3 TAPES AND STENCILS

A. Underground-Line Warning Tape:
1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE"

2.4 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
c. Engraved legend with black letters on white face.
d. Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use

multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

2. Install underground-line warning tape for direct-buried cables and cables in raceways.

3.2 IDENTIFICATION SCHEDULE

A. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Flush or Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Wash-Down Areas: NEMA 250, Type 4X,.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

F. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

G. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1 or Type 2 as shown on drawings.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. Panelboards: NEMA PB 1, distribution type.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.

3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. All circuit breakers 1200A and higher shall be equipped with energy-reducing maintenance switching with local status in order to provide arc energy reduction per NEC 240.87

C. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

    a. Inverse time-current element for low-level overloads.
    b. Instantaneous magnetic trip element for short circuits.
    c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

    a. RMS sensing.
    b. Field-replaceable rating plug or electronic trip.
    c. Field-Adjustable Settings:

        1) Instantaneous trip.
        2) Long- and short-time pickup levels.
        3) Long and short time adjustments.
        4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. Subfeed Circuit Breakers: Vertically mounted.
7. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NEMA PB 1.1.

C. Mount panelboard cabinet plumb and rigid without distortion of box.

D. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

G. Install filler plates in unused spaces.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Straight-blade convenience receptacles.
2. USB charger devices.
3. GFCI receptacles.
4. Toggle switches.
5. Wall plates.

1.2 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.

E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour/Legrand (Pass & Seymour).

2. All receptacle devices in childcare facilities and all education facilities shall be tamper-resistant. All devices shall meet requirements of NEC 406.12.

2.3 USB CHARGER DEVICES

A. Tamper-Resistant, USB Charger Receptacles: 12 V, 2.0 A, USB Type A and 20V, 3A, Type C; Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, UL 1310, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

3. USB Receptacles: Dual, Type A and Type C.
4. Line Voltage Receptacles: Dual, two pole, three wire, and self-grounding.

2.4 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour/Legrand (Pass & Seymour).

C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Pass & Seymour/Legrand (Pass & Seymour).

D. Locations:

1. Install GFCI devices at all locations required by NEC Article 210.8, whether or not indicated on plans. These locations include:
   a. Dwelling Units:
      1) Bathrooms
      2) Garages and similar accessory buildings
      3) Outdoors
      4) Crawl Spaces
      5) Basements
      6) Kitchens where receptacles are installed to serve countertop surfaces
      7) Within 6’ of the top inside edge of the bowl of a sink
      8) Boathouses
      9) Within 6’ of bathtubs or shower stalls
      10) Laundry areas
      11) Indoor damp and wet locations
   b. Other than dwelling units:
      1) Bathrooms
      2) Kitchens or areas with sink and permanent provisions for food prep or cooking
      3) Rooftops
      4) Outdoors
      5) Within 6’ of the top inside edge of the bowl of a sink
      6) Indoor damp and wet locations

7) Locker rooms with associated showering facilities
8) Garages, accessory buidlngs, service bays, and similar areas
9) Crawl Spaces
10) Unfinished areas of basements
11) Laundry areas
12) Within 6’ of bathtubs or shower stalls

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hubbell Incorporated; Wiring Device-Kellems.
2) Leviton Manufacturing Co., Inc.
3) Pass & Seymour/Legrand (Pass & Seymour).

2. Two Pole:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hubbell Incorporated; Wiring Device-Kellems.
2) Leviton Manufacturing Co., Inc.
3) Pass & Seymour/Legrand (Pass & Seymour).

3. Three Way:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hubbell Incorporated; Wiring Device-Kellems.
2) Leviton Manufacturing Co., Inc.
3) Pass & Seymour/Legrand (Pass & Seymour).

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Coordinate with architect for finish and color selection.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof While-In-Use Cover Plates: NEMA 250, complying with Type 3R, weather-proof while in use, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 unless otherwise indicated.

B. ARC-FAULT CIRCUIT-INTERRUPTER PROTECTION:
1. Provide arc-fault circuit interrupter protection at all locations required per 210.12 whether indicated on plans or not.
2. This includes any circuits serving outlets or devices in
   a. dwelling units
   b. dormitory units and their associated bedrooms, living rooms, hallways, closets, bathrooms, and similar rooms
   c. guest rooms, guest suites, and patient sleeping rooms
   d. For purposes of this requirement, all circuits serving outlets in bunk rooms or other associated sleeping rooms shall have AFCI protection

C. Mount Devices at the heights listed below unless listed specifically on drawings:
1. Exterior Outlet Boxes: 24” Above Finished Grade
2. Interior Outlet Boxes: 18” Above Finished Floor (AFF)
3. Device Boxes for Switches, Fire Alarm Pull Stations, Intercom Call Stations, etc.: 48” AFF
4. Outlet Boxes for Wall-mounted clocks: 96” AFF or 6” below the ceiling when not possible. Center clock outlets located above doors between the ceiling and the top of the door trip.
5. Above Counter Outlet and Junction Boxes: 8” above countertop surfaces or at backsplash level.
6. Coordinate mounting height of specific-use receptacles with equipment and finishes.
7. Coordinate mounting height to match mechanical devices (thermostats).

D. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

E. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

F. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

G. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

H. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

J. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.2 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:

a. Line Voltage: Acceptable range is 105 to 132 V.
b. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
c. Ground Impedance: Values of up to 2 ohms are acceptable.
d. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
e. Using the test plug, verify that the device and its outlet box are securely mounted.
f. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Horsepower Rated Toggle Disconnect Switch
6. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories (as required per plans):

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.

2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories (as required per plans):

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.
    a. If Square D, project shall be quoted, ordered, and managed by Randall Robinette in Little Rock Field Office. Phone# 501-803-9494.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated or series rated as indicated on the Drawings. combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 167 deg F rated wire.

G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the field-adjustable settings as indicated on drawings.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

2.5 Horsepower Rated, Toggle Switch Type Disconnect Switch

A. Toggle type disconnect switches shall be manufactured of thermoplastic materials with screw-type terminals. The switches shall be rated 600 VAC and 20A at 600 VAC.

B. Toggle type disconnect switches shall be similar to a manual non-reversing starter without overloads and shall be 3 Pole, capable of "on-off" control of a 10 horsepower motor at 460 VAC.

C. Enclosure shall be provided with lock off provisions.

D. NEMA 4 enclosures shall be die-cast zinc.

E. Switches shall be as manufactured by the Square D Co.; Siemens Electrical Products; Cutler-Hammer or equal.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure rating shall be equal to or greater than the fuse or circuit breaker rating.

C. Enclosure Finish: The enclosure shall be as indicated on drawings.

D. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

E. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

F. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

G. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices. Fuse Ratings for mechanical equipment or transformers shall match the rating of the upstream circuit breaker feeding the equipment.

E. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.
    a. Label on each disconnect means shall include both purpose and source, such as “AHU-1. Fed from Panel MDP”

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

    a. Inspect physical and mechanical condition.
    b. Inspect anchorage, alignment, grounding, and clearances.
    c. Verify that the unit is clean.
    d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    e. Verify that fuse sizes and types match the Specifications and Drawings.
    f. Verify that each fuse has adequate mechanical support and contact integrity.
    g. Inspect bolted electrical connections for high resistance using one of the two following methods:

        1) Use a low-resistance ohmmeter.

            a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

            a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

    h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
    i. Verify correct phase barrier installation.
    j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

B. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

    1) Use a low-resistance ohmmeter.

        a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

    2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

        a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 262816

SECTION 265119 - GENERAL LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Lowbay.
4. Recessed linear.
5. Strip light.
6. Surface mount, linear.
7. Surface mount, nonlinear.
8. Suspended, linear.
9. Suspended, nonlinear.
10. Materials.
11. Finishes.
12. Luminaire support.
13. Exit and Emergency Lighting

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

B. Product Schedule: Refer to light fixture schedule on the plans.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Schedule: Refer to light fixture schedule on the plans.

B. Fixture Schedule included in plans is basis of design. Equivalent alternates that meet all technical and aesthetics requirements are allowed and will be reviewed for equivalence by A/E team during submittal phase. Alternates shall include the following with their submittal, in addition to standard product data:
   1. Photometric lighting calculations for each space and exterior area.
   2. Control Device Layout showing part numbers and device locations.
   3. Lighting Fixture schedule including substituted fixture model number, voltage, wattage, and color temperature

C. Metal Parts:

   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers, and Globes:

   1. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Glass: Annealed crystal glass unless otherwise indicated.
   3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.2 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.3 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Exit Signs: Exit signs shall be roughed-in to be centered over or above door they are indicating as exit, or in hallways they are installed in. Exit signs in hallways shall be aligned with other lights in the area. Exit signs observed to be installed and not centered with doors or hallways shall be relocated at no additional cost.

F. Flush-Mounted Luminaire Support: Secured to outlet box.

G. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

H. Ceiling-Mounted Luminaire Support:

1. Ceiling mount per manufacturer’s recommendations.

I. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod, or wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

J. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

L. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 16553 "Identification for Electrical Systems."

M. Where 0-10V dimming is indicated in controls requirements, contractor shall furnish and install 0-10V dimming cabling to each fixture to accomplish dimming control.

N. Where a light fixture is indicated via plan or fixture schedule to be an emergency fixture, contractor shall route unswitched power to light fixture in addition to normal circuit such that fixture will sense an outage and automatically illuminate in an emergency situation.

O. All site lighting pole lights shall be installed to maintain 36” clear from back of curb to edge of concrete pole-base. Field verify final locations with final civil plan and edge of parking lots.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 265119

SECTION 271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. 19-inch wall-mounted equipment cabinets.
   2. Power strips.
   3. Grounding.
   4. Labeling.

1.2 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
   3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of RCDD.
2. Installation Supervision: Installation shall be under direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as Technician to perform on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. UL listed.

B. RoHS compliant.

C. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 19-INCH EQUIPMENT CABINETS

A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72 inches between rails.

B. General Cabinet Requirements:

1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Extruded aluminum.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

C. Modular Wall Cabinets:

1. Height: 22 inches.
2. Depth: 23 inches.
3. Load Rating: 200 lb.
4. Lockable front doors.
5. Louvered side panels.
6. Cable access provisions top and bottom.
7. Grounding lug.
8. Power strip.
9. All cabinets keyed alike.

D. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.

4. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.3 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, with detachable flanges.
3. Six, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
4. Front-facing receptacles.
5. LED indicator lights for power and protection status.
6. LED indicator lights for reverse polarity and open outlet ground.
7. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
8. Cord connected with 15-foot line cord.
9. Rocker-type on-off switch, illuminated when in on position.
10. Surge Protection: UL 1449, Type 3.

    a. Maximum Surge Current, Line to Neutral: 27 kA.
    b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
    c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be 600 V and 500 V for neutral to ground.

2.4 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.

3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.

1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."

END OF SECTION 271116

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Category 6 twisted pair cable.
   2. Twisted pair cable hardware, including plugs and jacks.
   3. Cable management system.
   4. Grounding provisions for twisted pair cable.

1.2 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

   1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
   2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
   3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.
   1. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment.

C. Twisted pair cable testing plan.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

1.6 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685.
2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
3. Communications, Non-plenum: Type CMR complying with UL 1666.
4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden .
2. CommScope, Inc.
3. General Cable.
4. Siemon.

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP).

F. Cable Rating: Riser OR Plenum as indicated on drawings or required by code.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of cabling being connected, spliced, and/or terminated.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks:

1. 110-style IDC for Category 5e.
2. 66-style IDC for Category 5e.
3. 110-style IDC for Category 6.
4. 110-style IDC for Category 6a.
5. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

F. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.

G. Faceplate:

1. Two, Four, or Six port (per drawings), vertical single gang faceplates designed to mount to single gang wall boxes.
2. Eight, Ten, or Twelve port (per drawings), vertical double gang faceplates designed to mount to double gang wall boxes.
3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
4. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
5. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

H. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

A. Comply with TIA-607-B.

PART 3 - EXECUTION

3.1 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

C. Wiring that is not installed in raceways and cable trays shall be installed in J-hooks mounted to walls above accessible ceiling. Maximum j-hook spacing shall be 5'. Cabling homeruns above accessible ceiling in corridors shall not be laid on ceiling grid.

D. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

E. General Requirements for Cabling:

1. Comply with TIA-568-C.1.
2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

3.2 FIRESTOPPING

A. Comply with TIA-569-D, Annex A, "Firestopping."

B. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.3 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Equipment grounding conductors.

C. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

D. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection. Provide test reports for owner and engineer's review upon completion of testing.

C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

END OF SECTION 271513

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SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Remote annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.

1.2 ACTION SUBMITTALS

A. General Submittal Requirements:

1. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level IV minimum.

B. Product Data: For each type of product, including furnished options and accessories.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.

10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Locate detectors according to manufacturer's written recommendations.

12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. Include the following:

    a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between all devices and equipment.
    d. Riser diagram.
    e. Record copy of site-specific software.
    f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

        1) Equipment tested.
        2) Frequency of testing of installed components.
        3) Frequency of inspection of installed components.
        4) Requirements and recommendations related to results of maintenance.
        5) Manufacturer's user training manuals.

g. Manufacturer's required maintenance related to system warranty requirements.
h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

B. Automatic sensitivity control of certain smoke detectors.

C. All components provided shall be listed for use with the selected system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.
6. Automatic sprinkler system water flow.
7. Fire-extinguishing system operation.
8. Fire standpipe system.
9. Dry system pressure flow switch.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
8. Activate preaction system.
9. Recall elevators to primary or alternate recall floors (if applicable).
10. Activate elevator power shunt trip(if applicable).
11. Activate emergency lighting control.
12. Activate emergency shutoffs for gas and fuel supplies.
13. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Elevator shunt-trip supervision.
3. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.4 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gamewell - FCI by Honeywell.
2. GE UTC Fire & Security; A United Technologies Company.
3. Notifier.
4. Siemens Industry, Inc.; Fire Safety Division.
5. Kidde

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

E. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.

G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

H. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

I. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.5 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
6. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.

a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
c. Multiple levels of detection sensitivity for each sensor.
d. Sensitivity levels based on time of day.

"

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.8 NONSYSTEM SMOKE DETECTORS

A. General Requirements for Nonsystem Smoke Detectors:

1. Nonsystem smoke detectors shall be listed as compatible with the fire-alarm equipment installed or shall have a contact closure interface listed for the connected load.
2. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72.

B. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac.
2. Auxiliary Relays: One.
3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet according to UL 464.
4. Visible Notification Appliance: 177-cd strobe.
5. Heat sensor, 135 deg F combination rate-of-rise and fixed temperature.
6. Test Switch: Push to test; simulates smoke at rated obscuration.
7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
10. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Single-Station Duct Smoke Detectors:

1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.

3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.

    a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; listed for use with the supplied detector.

4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.9 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.

1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.

1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.10 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Chimes: Vibrating type.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.

D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Mounting: Wall mounted unless otherwise indicated.
2. Flashing shall be in a temporal pattern, synchronized with other units.
3. Strobe Leads: Factory connected to screw terminals.
4. Mounting Faceplate: Factory finished, red.

2.11 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.12 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.13 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall (as required), to circuit-breaker shunt trip for power shutdown.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service..

2.14 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated HVAC duct systems.
2. Magnetically held-open doors.
3. Electronically locked doors and access gates.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt-trip breaker.
10. Supervisory connections at fire-extinguisher locations.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities, abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 015639 – Temporary Tree and Plant Protection
3. Section 015713 – Temporary Erosion and Sediment Control
4. Section 312000- Earth Moving

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store

on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during

construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
2. Use only hand methods or air spade for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth indicated on Drawings, of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade,pavements, turf and grasses, and, plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks, pavements.
6. Subbase course and base course for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports:

1.5 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

1. Arkansas Highway and Transportation Department Class 7 Aggregate Base Course (ABC)

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washedcrushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. To comply with local practice or requirements of authorities having jurisdiciton.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 0321313 "Concrete Pavement"."

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material, satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape:

1. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal

so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698, ASTM D1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent

ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Shape subbase course and base course to required crown elevations and cross-slope grades.
2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698, ASTM D1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed

work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312116 - TRENCHING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section Includes:

1. Excavating trenches for piped utilities.

B. Related Sections:

1. Section 312000 "Earthwork" for backfilling and compaction of utility trenches.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 013000 – Administrative Requirements: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable codes, and City of Batesville Ordinances.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Arkansas.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call “One Call”, the local utility information service at 811 not less than three (3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 of a cubic yard measured by volume. Remove larger material as specified in Section 312000 as rock excavation.

C. Perform excavation within 24 inches of existing utility service and in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe utilities.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by notify Engineer, and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with satisfactory fill material as defined in Section 312000, Earthwork and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with satisfactory fill as directed by Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft

material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new,and,existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Refer to Drawings and Section 312000, Earthwork for backfill procedure and materials for various pipe types.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.7 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Basis of acceptance shall include but not be limited to compacted density performed as specified herein.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method) or ASTM D 6938.

B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, Contractor shall perform additional compaction and testing, at his expense, until specified density is obtained.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction dewatering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls,",Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves,

appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.

C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.4 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.

PART 3 - EXECUTION

3.1 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation.

1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds.

1. Trim excavation as required to install lagging.
2. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.2 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.

1. Limit vertical offset of adjacent sheet piling to 60 inches.
2. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback, and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.4 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work.

If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.

1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.

1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.

END OF SECTION

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SECTION 320523 - CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. 312000 – EARTH MOVING

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

D. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
2. Manufacturer shall provide concrete mix designs stamped and sealed by a licensed professional Engineer licensed in the State of Arkansas.

B. Testing Agency Qualifications: An independent agency, approved by Owner and Engineer qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Testing Agency shall be managed by a licensed professional engineer licensed in the State of Arkansas.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage and provide a qualified independent testing agency to perform material evaluation tests and to sample and test concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed.

1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I or Class II, as approved, zinc coated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated,

Type 1, plain or deformed steel, as approved.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513,with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of

fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder-1: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound-1: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Concrete mixture designs shall be stamped and signed by a registered professional Engineer registered in the State of Arkansas.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures with approval from Engineer and according to manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete trail and pavement mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

E. Proportion normal-weight concrete bridge pier, abutment and structure mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.0 percent, plus or minus 1.5 percent at point of delivery for1-

inchnominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 fours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. Coordinate joint types, description, and location with Drawings. Joint types have been consolidated in this article for consistency rather than for strict sequence of installation.

B. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

C. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

D. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch . Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

F. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Concrete shall not be placed on top of mud, standing water, ice, trash, debris or anything other than the specified subbase material.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement: Comply with ACI 306.1.

E. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is

small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding,10-ft- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq.ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing

compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage and provide a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Sample concrete materials for slump, temperature and strength testing as required by ACI 301.

C. Provide one (1) set of concrete tests for each 50 cubic yards of material or fraction thereof.

D. Concrete test samples shall include four concrete cylinders for strength testing; one to be tested at 7 day, two to be tested at 28 day, and one spare to be tested at 56 days as required.

END OF SECTION

SECTION 321123 - AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Aggregate base course for Portland cement or asphalt concrete paving.

1.2 RELATED SECTIONS

A. Section 312000: Earthwork

B. Section 32126: Asphalt Pavement

C. Section 321313: Concrete Pavement

1.3 REFERENCES

A. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

B. ASTM D1557 – Test Methods for Moisture – Density Relations of Soils and Soil-Aggregate Mixtures Using 10lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

D. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Class 7 Base Course: Crushed stone base material with the following gradation:

1. Sieve (mm): 3” (75); Class 7 Percent Passing: N/A
2. Sieve (mm)-1: 2” (50); Class 7 Percent Passing: N/A
3. Sieve (mm)-2: 1-1/2” (37.5); Class 7 Percent Passing: 100
4. Sieve (mm)-3: 1” (25.0); Class 7 Percent Passing: 60-100
5. Sieve (mm)-4: 3/4” (19.0); Class 7 Percent Passing: 50-90
6. Sieve (mm)-5: 3/8” (9.5); Class 7 Percent Passing: N/A
7. Sieve (mm)-6: #4 (4.75); Class 7 Percent Passing: 25-55
8. Sieve (mm)-7: #10 (2.00); Class 7 Percent Passing: N/A
9. Sieve (mm)-8: #40 (0.425); Class 7 Percent Passing: 10-30
10. Sieve (mm)-9: #200 (0.075); Class 7 Percent Passing: 3-10

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces

3.3 AGGREGATE PLACEMNT

A. Spread aggregate over prepared substrate to a maximum compacted thickness of 6 inches per lift.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with 10 foot (3 m) straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557 and ASTM D6938, as indicated.

B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

C. Frequency of Tests: One per lift per 2,500 square feet or as otherwise recommended by the Geotechnical Engineer.

END OF SECTION

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.

B. Related Sections:

1. Section 321123 "Aggregate Base Course" for aggregate subbase and base courses.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Design: For each job mix proposed for the Work.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For each paving material, from manufacturer

1.4 QUALITY ASSURANCE

A. Allowable Tolerances:

1. Subgrade after fine grading:

a. Shall not vary more than 0.05 feet from plan elevation.

2. Aggregate base:

a. Shall not vary more than 0.05 feet from plan elevation.

3. Asphalt concrete hot mix binder course:

a. Shall not vary more than 0.04 feet from the plan elevation.
b. Shall not vary more than 0.04 feet from specified thickness.

4. Asphalt concrete hot mix wearing course:

a. Shall not vary more than 0.03 feet from the plan elevation.

b. Shall not vary more than 0.02 feet from specified thickness.
c. Shall not vary more than 0.015 feet from the edge of a 10 foot straight edge laid thereon parallel to or at right angles to the direction of paving.

5. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

a. Test and Design Mix Criteria:

1) Contractor, at his expense, shall employ the services of an independent testing laboratory to perform tests and design mixes. Materials and mix designs shall be approved at least 10 days before starting of construction

a) Aggregate tests (Aggregate Base Course):
b) The material to be used for the aggregate base course shall conform to Section 321123, Aggregate Base Course.
c) Preliminary job mix formula (Asphalt Concrete Hot Mix Surfacing):
d) A preliminary job mix formula shall be developed for the asphalt concrete hot mix surfacing material in accordance with AASHTO MP 2 or equal to AHTD requirements.
e) Resubmit a new job mix formula for OWNER'S approval if it becomes necessary to change the source of aggregates or when unsatisfactory results or other conditions warrant a change in mixture requirements.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert

material.

2.2 ASPHALT MATERIALS

A. Asphalt Bitumen for Binder Course and Surface Course: AASHTO M 320, PG 76-22

B. Bituminous Track Coat: CSS-1, CSS-1h, RC-70, MC-250, or OWNER approved equal.

2.3 MIXES

A. Hot-Mix Asphalt: Each mix design shall be prepared by laboratory analysis. Each mix design will establish a mix gradation for the aggregates (based on the weight of material passing specified screen sizes), an optimum asphalt binder content (expressed as a percentage of the total mix weight), an optimum laboratory mixing temperature, and an optimum laboratory compaction temperature. Optimum laboratory mixing and compaction temperatures shall be established based on temperature-viscosity curves of the asphalt binder to be used in the mix. The optimum asphalt content is the asphalt binder content at 4% Air Voids (AV) for PG 76-22 mixes and 4.5% Air Voids (AV) for PG 64-22 and PG 70-22 mixes. The mix design will be designed in accordance with the volumetric mix design procedures contained in AASHTO MP 2 and its referenced standards or equal to AHTD specified mix designs.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with granular fill as defined in Section 312000 and compact as specified in Section 312000.

3.2 AGGREGATE BASE

A. Where required, construct the aggregate base as shown on Drawings on the prepared subgrade as soon as possible after final shaping and compaction of the subgrade is completed.

B. Construction requirements shall be compacted to a density of at least 95 percent as defined by ASTM D1557 (Modified Proctor).

C. Density tests shall be taken as specified in Section 312000 and no bituminous layer shall be applied on the aggregate base course until it is approved by OWNER.

3.3 BITUMINOUS TACK COAT

A. Apply a bituminous tack coat to an existing bituminous surface if it has been dirtied by

traffic or by other means just before constructing another bituminous course. The face of all concrete surfaces to which the bituminous surface will come in contact with shall be sprayed or painted with tack oil.

3.4 BITUMINOUS BINDER COURSE

A. Construct a plant mixed bituminous binder course as shown on Drawings using a mechanical paver.

3.5 BITUMINOUS WEARING COURSE

A. Construct a plant mixed bituminous wearing course as shown on Drawings using a mechanical paver.

3.6 FIELD QUALITY CONTROLS

A. From time to time during progress of the work and/or upon completion of the work, OWNER may require that testing be performed to determine that materials provided for the work and its installation meets the specified requirements.

3.7 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or bituminous work indicate non-compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance, the area is considered defective and Contractor shall:

1. Remove and replace defective work at no cost to OWNER;
2. Correct the work at no cost to OWNER in a manner acceptable to OWNER; or
3. Give OWNER a credit towards the Contract Price if said credit is acceptable to OWNER.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish and construct all exterior portland cement concrete as shown on Drawings and herein specified.

1. Work to be included under this Section shall consist of the following:

a. Driveways, fire access lanes, dumpster approach, sidewalks, and any concrete pavement specified on the drawings.

B. Related Work Specified Elsewhere:

1. Section 312000: Earthwork
2. Section 321216: Asphalt Pavement

1.2 QUALITY ASSURANCE

A. Qualifications of Installers:

1. Provide at least 1 person at all times during execution of this portion of Work and who is thoroughly familiar with the type of materials being installed and is directly responsible for all Work performed under this Section.

B. Requirements of Regulatory Agencies:

1. It is Contractor's responsibility to comply with the requirements of the regulatory agencies, including the purchase of any permits at their own expense.

C. Construction Tolerances:

1. Vertical alignment shall not vary more than 1/8 inch from the edge of a 10-foot straight edge.
2. Horizontal alignment shall not vary more than 1/2 inch from the plan alignment for pavement.
3. Concrete thickness shall not be less than specified.
4. Reinforcing bars shall be placed to the following tolerances:

a. Clear distance to formed surface, plus or minus ¼ inch.
b. Sheared length, plus or minus 1 inch.
c. Concrete cover on top bars in slabs and beams 8 inches deep or less, 2 inches plus or minus 1/4 inch.
d. Concrete cover on top bars in members 8 inches to 24 inches deep, 2 inches plus or minus 1/2 inch.
e. Crosswise or lengthwise spacing, plus or minus 2 inches provided minimum spacing and cover requirements are not violated.

D. Referenced Standards:

1. The current editions of the following American Concrete Institute (ACI) publications shall govern all Work performed hereunder, unless otherwise specified:

    a. Recommended Practice for Concrete Floor and Slab Construction - ACI 302.
    b. Recommended Practice for Hot Weather Concreting – ACI 305.
    c. Recommended Practice for Cold Weather Concreting - ACI 306.
    d. Recommended Practice for Construction of Concrete Pavements and Concrete Bases - ACI 316.
    e. Building Code Requirements for Reinforced Concrete - ACI 318.

E. Design Criteria:

1. Contractor shall employ an approved independent materials testing laboratory and pay for the service of setting up the design mixes and to analyze the fine and coarse aggregate for the various uses of concrete utilized on the project. Design mixes shall be in accordance with the previously cited ACI 318 publication and in compliance with this Specification. The proposed mixes shall be submitted to OWNER for approval prior to placing of any concrete. The approved mixes established by the laboratory shall be used in the Work as long as the characteristics of the ingredients remain unchanged. If any significant change is made in the ingredients, new mixes shall be prepared and submitted to OWNER for approval.
2. Concrete shall consist of a minimum 28 day compressive design strength of 4,000 psi using portland cement, aggregate, air entraining admixture, water and an air content ranging from 5 to 7 percent. Slump of concrete shall have a range of 2 to 4 inches.

    a. If any of the conditions vary from those as described, Contractor shall submit a revised mix design prepared by the testing laboratory along with a written request for the variance desired to OWNER for their consideration and approval.
    b. Concrete for portions of the structure required to be watertight, such as water storage, pumpstation wetwells and waste treatment tanks, shall be air-entrained and have a water-cement ratio not exceeding 0.48.
    c. Admixtures shall be used only with the approval in writing by OWNER. All admixtures shall be used in accordance with the manufacturer's instructions and shall be added at the plant. Calcium chloride shall not be used as an admixture.
    d. Mix designs shall be based on Type I cement. Type III (high early) cement or any other types of cement shall be used only when approved in writing by OWNER. When high-early cement is used, the 7-day strength test shall exceed the specified 28-day strength tests.

1.3 SUBMITTALS

A. Product Data:

1. Prepare and submit product data for OWNER'S approval. Product data shall

include manufacturer's recommended installation instructions.

B. Samples:

1. If requested by OWNER, submit samples for approval of proposed materials.

C. Certification:

1. Submit 3 copies of certification of material compliance as requested by OWNER.

D. Delivery Tickets:

1. Submit a delivery ticket with each truck load of concrete delivered which indicates OWNER'S design mix, truck number, project number, Contractor, ready mix producer, time of batching and total yards of concrete.

E. Test Reports and Design Mixes:

1. Submit 3 copies of design mixes and material test reports to OWNER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Form Material:

1. Form material shall be either sound lumber or steel, free of defects and variations in dimensions. The sides of all lumber shall be surfaced and matched to prevent mortar leakage. Metal forms shall be of standard manufacture and need not be new, but shall be free from rust and dirt. Metal forms shall be flat and true to line without punctures. All form material shall be sized and of strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal of same.

a. Rigid forms are to be utilized on tangent alignment and curves having a radius of 150 feet or greater.
b. Curved forms shall be utilized on the curved Work with a radius of 150 feet or less, and shall consist of flexible spring steel or laminated lumber.

B. Reinforcement Materials:

1. Reinforcing bars and dowels shall be of new billet steel conforming to ASTM A615, Grade 60 (60,000 psi yield). Sizes of bars shall be as indicated on Drawings or herein specified.

a. Dowel bars when used for contraction and expansion joints shall be smooth steel bars coated with a thin uniform coating of liquid asphalt (MC-250) or grease on 1/2 the length of the bar plus 2 inches. In addition, dowel bars for expansion joints shall be furnished with end caps designed with one end closed, a minimum length of 3 inches and be positioned to allow bar movement of not less than 1 inch.

b. Dowel bar assemblies may be permitted if fabricated to the width of the pavement section.
c. Tie bars for control, longitudinal and construction joints shall be deformed bars.

C. Concrete Materials:

1. Portland cement shall conform to ASTM C150.

a. Cement shall be a low alkali cement (Type I) containing not more than 0.6 percent by weight of tri-sodium silicate oxide.

2. Coarse aggregate shall conform to Size 57 grade requirements of Table 2 of ASTM C33 standard.
3. Fine aggregate shall conform to ASTM C33 with fineness modulus not to vary more than 0.20 from value assumed in design mix.
4. Water shall be potable, clean and free from deleterious amounts of acid, alkali or organic material.

D. Admixtures:

1. Air entraining agent shall conform to ASTM C260 and shall be added at the mixer.
2. Water reducing agents, (such as super plasticizers), retarding agents, accelerating agents and all other admixtures, shall require approval by OWNER and if used, shall conform to ASTM C494. In no case shall admixtures be permitted as substitute for cement content specified, unless approved by OWNER.

E. Expansion Joint Material:

1. Joint filler material shall consist of a non-extruding standard bituminous bound type "Sealtight Asphalt Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois or OWNER approved equal.

a. Material shall conform to ASTM D994.

2. Joint filler material shall consist of preformed non-extruded bituminous bound type "Sealtight-Fibre Expansion Joint" as manufactured by W.R. Meadows, Inc., Elgin, Illinois; "Code 1390" as manufactured by W.R. Grace Company, Cambridge, Massachusetts or OWNER approved equal.

a. Material shall conform to ASTM D1751.
b. Material shall be 1/2 inch thick, unless otherwise noted, of widths equal to slab thickness less 1/2 inch or as otherwise indicated.

3. Joint sealant shall be a single component, polyurethane type "Sikaflex-la" as manufactured by Sika Chemical Corporation, Lyndhurst, New Jersey or OWNER approved equal. Color as selected by OWNER.

F. Curing Materials:

1. Kraft paper shall be waterproof and nonstaining "Sisalkraft 5K-10" conforming to ASTM C171.

2. Polyethylene film shall be white opaque sheet or roll material not less than 0.006 inch thick (6 mil) conforming to AASHTO-M171.
3. Contractor may at their option use a liquid curing compound for surfaces that will not receive treating oil or waterproofing membrane. Liquid curing compound shall conform to ASTM C309 and shall consist of the following:

    a. Type 1D, translucent with fugitive dye.
    b. Type 2, white pigmented, Class B (vehicle solids restricted to all resin).

2.2 PRODUCTION

A. Concrete shall be ready-mixed, and shall be batched, mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C94. The production plant equipment and facilities shall meet the requirements of the National Ready Mixed Concrete Association.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Hot Weather Conditions:

1. The following precautions shall be adhered to:

    a. Reject concrete mixture having temperature of 85ºF or greater.
    b. Pre wet subgrade.
    c. Crushed or flaked ice may be utilized in reducing temperature of mixture.
    d. If necessary, reduce temperature of reinforcing steel with wet burlap.
    e. Reduce mixing time (agitating time) in truck to 45 minutes.
    f. During periods of high winds, shelter windward side with adequate wind breaks.
    g. Apply no chemical retarder to finished surface unless permission is granted in writing by OWNER.

B. Cold Weather Conditions:

1. When ambient temperature is 40ºF or less, the following precautions are to be adhered to:

    a. Subbase shall not be frozen.
    b. Concrete mixture delivered at Worksite shall be 55ºF (minimum), 85ºF (maximum).
    c. No calcium chlorides, salts or other chemical accelerators shall be permitted, unless otherwise acceptable in writing by OWNER.
    d. Concrete surface shall be maintained at a minimum of 50ºF with appropriate thermal insulation for a period of 7 days (normal concrete), 3 days (high early-strength concrete).
    e. Refer to previously cited ACI 306 for minimum thickness of thermal protection required.
    f. Any concrete that has frozen or disintegrated as a result of freezing shall

be removed and replaced at Contractor's expense.

3.2 SUBGRADE PREPARTION

A. Fine grade and compact subgrade to the plan cross section. Compaction shall be as specified in Section 312000 of this Specification or as indicated on the Drawings.

B. After compaction, cut-out soft spots and unstable areas in the subgrade and fill with select fill material and compact as specified in Section 312000.

3.3 GRANULAR BASE

A. Construct the select fill and granular base as shown on Drawings on the prepared subgrade after the final shaping and compacting of the subgrade is completed.

B. Compact as specified base in Section 312000 of this Specification.

3.4 FORM CONSTRUCTION

A. Forms shall have the strength and rigidity, regardless of material, such that when they are set in place and braced, they will withstand weight of equipment and weight of concrete without settlement or lateral displacement.

B. Keyway forms in the edge of pavement slabs and at construction joints shall be constructed to the dimensions shown on Drawings. Wood keyway forms, if used, shall be bolted or nailed to the side forms. Metal keyway forms shall be fixed or held rigidly in place by staking or other OWNER approved method.

C. Forms shall be coated prior to the placement of concrete, with a nonstaining form release agent. Wooden form may be prewetted with water. No standing water, adjacent to forms, shall be permitted.

3.5 REMOVAL OF FORMS

A. Forms for slabs on grade shall not be removed earlier than 12 hours after the placement of concrete has been completed. Within 24 hours of form removal backfill adjacent to the pavement shall be completed.

B. Forms supporting the weight of concrete shall not be released until the concrete has reached its specified 28-day strength. Minimum time elapse after casting and before the false Work supports are released shall be 8 days for spans up to 96 inches center to center of supports, plus 1 additional day for each 12 inches of increase in span length over 84 inches up to 14 days for span of 14 feet and over. Such time period shall be exclusive of those time intervals during which the concrete surface temperature is below 40ºF. If temperature remains below 40ºF during the casting and curing period no forms shall be removed until approved field tests indicating adequate concrete strength have been provided.

3.6 REINFORCEMENT PLACEMENT

A. Tie bars, reinforcement bars and dowel bars shall be clean, free from rust and shall be placed on adequate supports in locations as shown on Drawings. Provide the following minimum thickness of concrete cover:

1. Concrete deposited on ground: 3 inches
2. Formed surfaces against ground: 1-1/2 inches
3. Beams, girders and columns: 1-1/2 inches
4. Slabs, walls and joists: 1 inch
5. Clear distance between parallel bars: 1 inch or nominal bar distance
6. For No. 6 bars or larger: 2 inches
7. No broken brick, block or concrete shall be permitted as reinforcement supports.

B. Welded steel wire fabric shall be placed free from rust, kinks and bends and shall be cut in such a way that the overlap measured between outermark cross wires of each fabric sheet is not less than 2 inches. The fabric shall be cut at contraction joints. It shall be supported by a layer of fresh concrete placed to the depth of the mesh shown on Drawings, followed by placement of the upper layer of concrete.

3.7 JOINTS

A. General:

1. Construct expansion, contraction and construction joints with face perpendicular to surface of concrete.
2. Where joining existing structures, match existing contraction or expansion joints.

B. Expansion Joints:

1. All fixed objects, such as buildings and structures or pavement, sidewalks or curb intersections shall be separated by a 1/2 inch expansion joint placed at the full depth of the concrete thickness. Expansion joints, in addition to the above, shall be placed at 60 foot intervals in the following:

    a. Concrete curb and gutter
    b. Concrete walk

C. Construction Joints:

1. Contraction joints shall be placed at the following intervals and dimensions or as shown on Drawings:

    a. Concrete curb and gutter – 10 feet; 1/8 inch wide by 1 1/2 inch depth.
    b. Concrete walk – 10 feet; 1/8 inch wide by 1/4 the depth of concrete.

2. Cut plastic concrete with appropriate tool to specified depth. Finish edges with 1/4 inch radius tool.
3. Saw-cut joints to specified width and depth on hardened concrete as soon as concrete has hardened sufficiently to prevent raveling or damage to the joint.

D. Joint Sealer:

1. Apply joint sealer to a clean and dry expansion or contraction joint if specified to a point approximately 1/4 inch below the top surface. Where oil treatment is specified, joint sealer shall be applied prior to application of the oil.

3.8 CONCRETE PLACEMENT

A. Place concrete to required depth and width to form a continuous mass requiring a minimum of rehandling. Concrete adjacent to side forms and fixed structures shall be consolidated by means of portable vibrators or by mechanical means with the use of hand spading. Vibrators shall not be used to move concrete horizontally.

B. If it is necessary to place a construction joint prior to a contraction joint, the distance between the construction joint and the previous contraction joint shall not be less than 60 inches.

C. Automatic machine may be used for curb and gutter placement at Contractor's option, if acceptable to OWNER. If machine placement is to be used, submit revised mix design and laboratory test results, which meet or exceed the minimum herein specified. Machine placement must produce curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.9 CONCRETE FINISH

A. After initial strike-off and floating, and prior to finishing, test surface with 10-foot straightedge. Correct irregularities prior to final finishing operations.

B. Apply the following surface finish after surface sheen or excess moisture has disappeared:

1. Apply steel trowel finish followed by stiff-bristled broom drawn across concrete surfaces, perpendicular to line of traffic:

    a. Sidewalk
    b. Concrete pavement
    c. Curb and gutter

3.10 CONCRETE CURING AND PROTECTION

A. Cure concrete surfaces for 7 days (normal concrete) and for 3 days (high early-strength concrete), using appropriate means of protection as previously cited in ACI 305 and ACI 306.

B. Curing methods shall consist of one of the following:

1. Keep concrete surface continuously wet by ponding with water.
2. Apply moisture proof fabric to entire area lapping joints and edges at least 3 inches. Tape interior joints and weight edges down with sand or other approved material.
3. Apply liquid membrane curing compound to the finished surface in a 2 coat

continuous operation with second application applied transversely to the direction of the first application, and in accordance with the manufacturer's directions. Replace damaged areas with equal applications of membrane using compound. Liquid membrane curing compound shall not be permitted where the surface will be subjected to an application of waterproof coatings, bonding agents, treating oil or paint.

3.11 TESTING AND EVALUATION

A. Concrete materials and operations shall be tested and inspected as the Work progresses, by an independent testing laboratory. Contractor shall furnish any necessary labor who is familiar with methods of sampling and shall assist the testing agency in obtaining and handling samples, and for safe storage and proper curing of concrete test specimens on Worksite.

B. Mold and cure three standard 6-inch diameter specimens from each sample in accordance with ASTM C31. Compressive strength test specimens shall be in accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high-early strength concrete is used, the first specimen shall be tested at 3 days; the remaining two at 7 days.

C. Make at least one strength test for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one day.

D. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using standard slump cone as per ASTM C143.

E. The testing laboratory shall report all test and inspection results to OWNER, OWNER’S Engineer, and Contractor immediately after they are performed. All concrete test reports shall include name of job, date of placement, date of test, batch mix design, slump and the exact location in the Work at which the batch represented by the test was deposited.

F. All costs necessary to prepare concrete test cylinders, make tests and furnishing of written reports shall be borne by the Contractor.

3.12 DEFECTIVE WORK

A. When tests and inspections of the aggregate base and/or concrete Work indicate non-compliance with the Specification, Contractor and OWNER shall mutually agree on the number and location of additional tests to define and/or verify the deficiency. If the average of the tests for a given area indicate non-compliance the area is considered defective and Contractor shall:

1. Remove and replace defective Work at no cost to OWNER;
2. Correct the Work at no cost to OWNER in a manner acceptable to OWNER;

3. Give OWNER a credit towards the Contract Price if it is acceptable to OWNER;
4. If Work is found to be in noncompliance, Contractor shall pay for the defective area removal and replacement, and the tests and inspection costs; or
5. If Work is found to be in compliance, OWNER shall pay for tests and inspection costs.

END OF SECTION

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Joint-sealant backer materials.
4. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: for each type of product

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANT

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPIED JOINT SEALANT

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant ASTM D 6690, Type I, II, or III.

D. D 6690, Type IV.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Cleaning of Joints: Clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer.

D. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

E. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

F. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

H. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

I. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete pavers.
2. Curbs and edge restraints.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for concrete base under unit pavers,and,for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For the following:

a. Pavers.
b. Edge restraints.
c. Precast concrete curbs.

B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

C. Samples for Initial Selection: For each type of unit paver indicated and the following:

1. Joint materials involving color selection.
2. Exposed edge restraints involving color selection.
3. Precast concrete curbs.

D. Samples for Verification: For full-size units of each type of unit paver indicated. Include Samples of the following:

1. Joint materials.
2. Exposed edge restraints.
3. Precast concrete curbs.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's field supervisor must have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with one of the following designations:

1. Commercial Paver Technician Designation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.6 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Mortar and Grout:

1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.

a. When ambient temperature exceeds 100 deg F , or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F , set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

A. Concrete Pavers, Solid Interlocking Paving Units: Complying with ASTM C936/C936M, made from normal-weight aggregates.

1. Thickness: As indicated.
2. Face Size and Shape:

    a. As indicated.

3. Color: As indicated.

2.3 CURBS AND EDGE RESTRAINTS

A. Job-Built Concrete Edge Restraints: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi .

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for subbase material.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with requirements in Section 312000 "Earth Moving" for base course.

C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33/C33M for fine aggregate.

D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200sieve.

1. Provide sand of color needed to produce required joint color.

E. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.

3. Permittivity: 0.02 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

F. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
3. Permittivity: 0.5 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

G. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.5 MORTAR AND GROUT MIXES

A. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.

B. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C270, Proportion Specification.

C. Thinset Mortar Bond Coat: Proportion and mix according to manufacturer's written instructions.

D. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed portland cement and aggregate grout to match setting-bed mortar except omit hydrated lime and use enough water to produce a pourable mixture.

E. Packaged Grout: Proportion and mix according to grout manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Pattern: As indicated.

F. Tolerances:

1. Do not exceed 1/4 in 10 feet from level, or indicated slope, for finished surface of paving.

G. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
3. Install job-built concrete edge restraints to comply with requirements in Section 033000 "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Place separation geotextile as indicated over prepared subgrade, overlapping ends and edges at least 12 inches.

B. Place aggregate subbase and base, compact to 100 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated.

C. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.

D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

E. Treat leveling course with herbicide to inhibit growth of grass and weeds.

F. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1 /8 inch being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

    1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

G. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

H. Do not allow traffic on installed pavers until sand has been vibrated into joints.

I. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

    1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

END OF SECTION

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Painted markings applied to asphalt paving.
2. Painted markings applied to concrete paving and surfaces.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

B. Markings Standards: Comply with applicable MUTCD current Standards.

2.2 PAVEMENT MARKING PAINT

A. MPI #97, latex traffic-marking paint.

1. Asphalt Application

a. Color: Pantone Cool Gray 3 C or approved equal.

2. Concrete Application

a. Color: Pantone Cool Gray 10 C or approved equal.

3. Fire Lane Application

a. Color: Pantone 484 C or approved equal.

4. ADA Application Colors:

    a. Pantone 7691 C or approved equal.
    b. Pantone Cool Gray 3 C or approved equal (asphalt).
    c. Pantone Cool Gray 10 C or approved equal (concrete).

B. Glass Beads: AASHTO M 247, Type 1.

2.3 PAVEMENT MARKING THERMOPLASTIC

A. All public rights of way shall receive thermoplastic markings stipes. Color to be approved through submittal.

1. Color: White or Yellow

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

END OF SECTION

SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place detectable warning tiles.
2. Detectable warning mats applied to existing concrete paving.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities, and, ICC A117.1 for tactile warning surfaces.

1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

2.2 DETECTABLE WARNING TILE

A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles with replaceable surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.

1. Material Molded glass- and carbon-fiber-reinforced polyester.
2. Color: Safety yellow or As selected by Architect from manufacturer's full line.
3. Shapes and Sizes:

a. Rectangular panel, 24 inches by width of crossing, or as shown on plans
b. Radius panel, nominal 24 inches deep by 6-foot outside radius, or as shown on plans.

4. Dome Spacing and Configuration: 1.67-inch, in square pattern.
5. Mounting:

a. Permanently embedded detectable warning tile wet-set into freshly poured

concrete.

b. Detectable warning tile set into formed recess in concrete and adhered with adhesive.

c. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.

B. Surface-Applied Detectable Warning Tiles: Accessible truncated-dome detectable warning concrete tiles configured for surface application on existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of tile, and beveled outside edges.

1. Material Molded glass- and carbon-fiber-reinforced polyester.
2. Color: Safety yellow or As selected by Architect from manufacturer's full line.
3. Shapes and Sizes

   a. Rectangular panel, 12 by 12 inches.
   b. Radius panel, nominal 24 inches deep by 6-foot outside radius.

4. Dome Spacing and Configuration 1.67-inch spacing, in square pattern.
5. Mounting Adhered and fastened to existing concrete walkway.

2.3 DETECTABLE WARNING MAT

A. Surface-Applied Detectable Warning Mats: Accessible truncated-dome detectable warning resilient mats, UV resistant, manufactured for adhering to existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of mat, and beveled outside edges.

1. Material Modified rubber compound, UV resistant.
2. Color Yellow
3. Shapes and Sizes

   a. Rectangular panel, 24 by 36 inches.

4. Dome Spacing and Configuratio: 1.67-inch spacing, in square pattern
5. Mounting Adhered to pavement surface with adhesive and fastened with fasteners.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:

1. Furnish Type 316 stainless-steel fasteners for exterior use.
2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

C. Cast-in-Place Detectable Warning Tiles: Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. Set surface of tile flush with surrounding concrete and adjacent tiles. Remove concrete from tile surfaces and clean using methods recommended in writing by manufacturer.

D. Removable Cast-in-Place Detectable Warning Tiles: Set each detectable warning tile accurately and firmly in place with embedding anchors and fasteners attached, and firmly seat tile back in wet concrete by tamping or vibrating. Set surface of tile flush with surrounding concrete and adjacent tiles. Remove concrete from tile surfaces and clean tiles using methods recommended in writing by manufacturer.

E. Surface-Applied Detectable Warning Tiles: Prepare existing paving surface by grinding and cleaning as recommended by manufacturer. Apply adhesive to back of tiles in amounts and pattern recommended by manufacturer, and set tiles in place. Install anchor devices through face of tiles and into pavement using anchors located as recommended by manufacturer. Apply sealant in continuous bead around perimeter of installation.

F. Surface-Applied Detectable Warning Mats: Prepare existing paving surface by grinding and cleaning as recommended by manufacturer. Apply adhesive to back of mat and set mat in place. Firmly seat mat in adhesive bed. Install anchor devices through face of mat and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with mat surface. Apply sealant in continuous bead around perimeter of mat.

G. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

H. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

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SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping joining materials.
2. Dielectric fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Piping system common requirements.
7. Concrete bases.
8. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

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.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D2235.
2. CPVC Piping: ASTM F493.
3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
4. PVC to ABS Piping Transition: ASTM D3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system

fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description: Factory fabricated, union, NPS 2 and smaller:

a. Pressure Rating: 250 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. Description Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger:

a. Pressure Rating: 300 psig.
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Description Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller:

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded.

E. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

a. Pressure Rating: 300 psig at 225 deg F.
b. End Connections: Threaded or grooved.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220500 "Common Work Results for Plumbing."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

D. Pipes with OD, including Insulation, Less than 6 inches:

1. Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

F. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

G. Pipes with OD, including Insultation, 6 inches and Larger:

1. Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

H. Lettering:

1. Use piping system terms indicated and abbreviate only as necessary for each application length.

a. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

I. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

J. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material:

    a. 0.032-inch-thick, aluminum.
    b. 0.0375-inch-thick stainless steel.
    c. 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.
    d. Valve manufacturer's standard solid plastic.

2. Size: 1-1/2 inches in diameter, unless otherwise indicated.
3. Shape: As indicated for each piping system.

K. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

L. Engraved Plastic-Laminate Signs: ASTM D709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness:

    a. 1/8 inch unless otherwise indicated.
    b. 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.

3. Fasteners: Self-tapping, stainless steel screws or contact-type permanent adhesive.

M. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.5 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts for Main Lines:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Cast-Iron Cleanouts for RV Stalls:

1. Description: 4” RV Female Footloose Sewer Cap (White), Enviro Design Products or equal. Submit shop drawing.
2. Sewer Pipe Fitting and Riser to Cleanout: Schedule 40 PVC

PART 3 - EXECUTION

3.1 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Dielectric nipples.

3.2 INSTALLATION OF PIPING

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Pipe Sleeves: PVC. For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities 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. 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.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B32.

I. 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.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 appendixes.
3. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
5. PVC Nonpressure Piping: Join according to ASTM D2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to

pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 INSTALLATION OF EQUIPMENT

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches , and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among

multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.9 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

END OF SECTION

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular precast concrete manhole and structures with tongue-and-groove joints, cover frame, covers, anchorage, and accessories. For junction box and inlet structure, and detention basin.
2. Bedding and cover materials.

B. Related Sections:

1. Section 32 0523 - Concrete for Exterior Improvements: Concrete for manhole and structure base pad construction.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 318 - Building Code Requirements for Structural Concrete.
2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A536 - Standard Specification for Ductile Iron Castings.
4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C55 - Standard Specification for Concrete Brick.
6. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
7. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
8. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
9. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
10. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
11. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester

1.3 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 SUBMITTALS

A. Shop Drawings: Indicate manhole and structure locations, elevations, piping, and sizes and elevations of penetrations.

B. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Batesville's applicable standards requirements and the Arkansas Department of Transportation (ARDOT) Standard Specifications.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and structures.

B. Store precast concrete manholes and structures to prevent damage to Owner’s property or other public or private property. Repair property damaged from materials storage.

C. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: ACI 530.

PART 2 - PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Manufactures

1. Precast Manhole square manhole.

a. Hanson Pipe and Products, Inc, 48-inch square manhole or equal.

B. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923 or cast-in-place (submit shop drawings for cast-in-place reinforcement and dimensions) .

C. Mortar and Grout: As specified in Section 040511, Masonry Mortar and Grout. Type S.

D. Reinforcement: As specified in Section 320523, Concrete for Exterior Improvements.

2.2 FRAMES AND COVERS

A. Refer to Drawings for frame, grates, and covers required for each manhole and structure.

B. Product Description: Cast iron construction, machined flat bearing surface and as shown on the Drawings.

2.3 COMPONENTS

A. Manhole Steps: corrosion resistant, coated, and reinforced with steel per ASTM C-478. Steel reinforcing minimum 1/2" diameter. Formed integral with manhole and structure sections.

2.4 CONFIGURATION

A. Shaft Constructions: As indicated on the Drawings, lipped male/female joints; sleeved to receive pipe sections.

B. Shape: As indicated on the Drawings.

C. Clear Inside Dimensions: As indicated on the Drawings.

D. Design Depth: As indicated on Drawings.

E. Clear Cover Opening: As indicated on Drawings.

F. Pipe Entry: Furnish openings as indicated on Drawings.

G. Steps: As required by code.

2.5 BEDDING AND COVER MATERIALS

A. Refer to Section 312116, Trenching.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify built-in items are in proper location, and ready for roughing into Work.

C. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Excavation and Backfill:

1. Excavate for manholes and structures in accordance with Section 312000 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, trowel top surface level.

C. Place manhole and structure sections plumb and level, trim to correct elevations, anchor to base pad.

D. Backfill excavations for manholes and structures in accordance with Section 312000.

E. Form and place manhole and structures cylinder plumb and level, to correct dimensions and elevations.

F. Cut and fit for pipe sections.

G. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

H. Set cover frames and covers level without tipping, to correct elevations.

I. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 312000 and 312116 or on other support system shown on Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer’s plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole and structures as shown on Drawings.

3.5 FRAME AND COVER INSTALLATION

A. Set frames using mortar and pre-cast concrete rings. Install precast reinforced concrete rings. Lay precast concrete rings in full bed of mortar and completely fill joints.

3.6 FIELD QUALITY CONTROL

A. Test cast-in-place concrete in accordance with Section 32 0523 Concrete for Exterior Improvements.

B. Vertical Adjustment of Existing Manholes and Structures:

1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.

2. Reset existing frames, grates and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.
3. Remove concrete without damaging existing vertical reinforcing bars when removal of existing concrete wall is required. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement, as indicated Drawings.
4. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete in accordance with Section 32 0523.

END OF SECTION

SECTION 33 1000 - SITE WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for site water line including domestic water line and fire water line
2. Valves.
3. Hydrants.
4. Positive displacement meters.
5. Backflow preventers.
6. Underground pipe markers.
7. Precast concrete vault.
8. Bedding and cover materials.

B. Related Sections:

1. Section 31 2000 - Earthwork: Product and execution requirements for excavation and backfill required by this section.
2. Section 31 2116 - Trenching: Execution requirements for trenching required by this section.
3. Section 33 1100 – Water service connections: Connections for domestic water service 2 inches or smaller.
4. Section 33 1200 - Disinfection of Water Distribution: Disinfection of site service utility water piping.
5. Section 32 0523 – Concrete for Exterior Improvements: Concrete for thrust restraints.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:

1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

D. ASTM International:

1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
2. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
6. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
7. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
11. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
12. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:

1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C502 - Dry-Barrel Fire Hydrants.
7. AWWA C504 - Rubber-Sealed Butterfly Valves.

8. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
9. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C606 - Grooved and Shouldered Joints.
12. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
13. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
14. AWWA C702 - Cold-Water Meters - Compound Type.
15. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
17. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
18. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

G. Underwriters Laboratories Inc.:
1. UL 246 - Hydrants for Fire - Protection Service.

1.3 SUBMITTALS

A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the project specifications or City of Batesville’s standard specifications - whichever is more stringent, City of Batesville’s Fire Department’s, the Arkansas Department of Health’s requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe: AWWA C151: AWWA C104:
1. Fittings: Ductile iron, standard thickness.

2. Joints: Mechanical joint or flanged as indicated, or AWWA C111, rubber gasket with rods.

3. Jackets: AWWA C105 polyethylene jacket, Double layer, half lapped, 10 mil polyethylene tape.

B. Copper Tubing: ASTM B88, Type K, annealed:

1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.

2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

C. PVC Pipe: ASTM D1784 and CS-256 Type 1, Grade 1 or Grade 2, Polyvinyl Chloride Plastic. Pipe shall conform to ASTM D2241, SDR-17 Pressure Class 250:

1. Fittings shall be in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

2. Joints shall be in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

2.2 GATE VALVES

A. Manufacturers:

1. American Darling.

2. Mueller.

3. Smith Metropolitan.

4. Approved equal.

B. 2-1/2 inches and Smaller: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression IPS ends, with control rod, post indicator, extension box and valve key.

C. 3 inches and Larger: AWWA C509, Iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, flanged mechanical joint ends, control rod, post indicator, extension box and valve key.

2.3 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

B. Trace Wire: 12-gauge insulated copper wire, insulating jacket shall be a minimum of 30 mil polyethylene complying with ASTM-D-1248, 30 volt rating, brightly colored plastic covering, imprinted with "Water Service" in large letters.

2.4 TAPPING SLEEVES

A. Sleeves may be iron or steel. Tapping sleeves shall be designed for a working pressure of at least 175-psi and a test pressure as required for the project (225 psi or greater as required). Fabricated steel sleeves shall be Type 304 stainless steel OR carbon steel coated with high build Thermo-Set Epoxy. A test plug shall be furnished through the body for hydrostatic pressure testing on all sleeves. The outlets shall conform to ANSI B16.1, Class 125 flanges designed to accept tapping valves described herein. All bolts shall be of corrosion resistant alloy. Sleeves may be designed for a watertight seal by the use of mechanical followers or by the use of a gasket placed in a recess between the

sleeve body and the pipe barrel. Only sleeves with mechanical followers or full circle gaskets may be used for full size taps. The use of other type sleeves is restricted to taps where the branch is at least one size smaller than the run.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on Drawings.

B. Cover: As indicated on the Drawings.

C. Soil Backfill from Above Pipe to Finish Grade: As indicated on the Drawings.

2.6 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 32 0523.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 33 1100 for Work of this Section.

B. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil as indicated on the Drawings.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent of Standard Proctor.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.

3.4 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with Arkansas Department of Health requirements and in accordance with the below:

1. All water mains are to cross over sewer mains with a minimum of 18-in of vertical separation and water and sewer mains shall have a minimum of 10-ft horizontal separation.
2. Where 18-in of separation cannot be achieved, the water or sewer main shall be encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing.
3. Where a water main must unavoidably pass beneath the sewer line, at least 18 in of separation must be maintained between the outside of the two pipes in addition to either the water or sewer main being encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing.

B. Install pipe to indicated elevation to within tolerance of 1 inch.

C. Install ductile iron piping and fittings to AWWA C600.

D. Route pipe in straight line as indicated.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints.

F. Install access fittings to permit disinfection of water system performed under Section 02516.

G. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

H. Establish elevations of buried piping with not less than 2.5ft of cover.

I. Install trace wire continuous buried 6 inches below finish grade, above pipe line; coordinate with Section 33 1100.

J. Backfill trench in accordance with Section 31 2116.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.6 TAPPING SLEEVES AND VALVES

A. The pipe shall be free of dirt and other debris before attaching tapping sleeve or tapping saddle. That part of the pipe barrel, other than concrete pipe, which will be in contact with the gasket of tapping saddles, shall be smooth. All rough areas on the pipe barrel shall be smoothed. The CONTRACTOR shall field verify all pipe and fitting dimensions. Tapping sleeve, tapping saddle, or direct tap shall be installed at least twenty-four (24) inches from bell joints, fittings, end of pipe joint, or another tap.

B. Tapping saddles or sleeves shall be bolted securely to the pipe. The face of the outlet shall be plumb. Mechanical joint glands for tapping sleeves shall be installed. The strap bolts for tapping saddles shall be alternately tightened "snug" and then alternately tightened to a torque of 100 foot-pounds.

C. The tapping valve shall be bolted securely to the tapping sleeve or tapping saddle outlet flange. The tapping valve shall be adequately supported from beneath. The weight of the tapping valve shall not be supported by the tapping sleeve/saddle. A concrete “mud slab” at least six (6) inches thick shall be poured under the location of all tapping valves 14 inches and larger and the weight of the valve shall be supported by the mud slab. The tapping machine shall be bolted securely to the valve.

D. After installation of the tapping sleeve or saddle and the tapping valve and before drilling through the pipe, the assembly shall be hydrostatically tested at the pressure specified by the City of Batesville’s water department, by introducing water through the sleeve or saddle test tap.

E. The pilot drill and shell cutter shall be in good condition. The pilot, shell cutter, and any other component of the tapping machine that will or may come into contact with the interior of the tap valve, tap saddle, or potable water pipe, shall be thoroughly sterilized with straight bleach or super-chlorinated solution. The shell cutter shall be the size required to cut the full opening specified.

F. Only qualified operators shall operate the tapping machine. The "coupon" shall be withdrawn and be given to the ENGINEER for inspection. Care shall be exercised to avoid drilling or cutting the backside of the pipe by carefully assuring the engagement of the pilot drill and shell cutter shaft.

G. Openings in the pipe barrel for tapping saddles installed on dry pipe shall be cut with a pilot drill and shell cutter. Torch cutting is not permitted.

H. Tapping operations must not commence before inspection by the ENGINEER or his authorized representative. Tapping operations must not commence before the tapping assembly has passed a pressure test as required by the City of Batesville's water department.

I. A thick coat of coal tar epoxy or other approved bituminous material shall be applied to the straps and bolts of saddles after installation and cleaning or by enclosing polyethylene material in accordance with the City of Batesville's water department requirements.

J. Tapping saddles and sleeves with a run size 2" or larger shall be adequately thrust blocked with concrete.

3.7 SERVICE CONNECTIONS

A. Install water service in shall be in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent..

B. Install water meter and backflow preventer in concrete vault located on site.

C. Install water service to 5 feet of building. Connect to building water service.

D. Install Work in shall be in accordance with the project specifications or City of Batesville's standard specifications - whichever is more stringent, City of Batesville's Fire Department, and Arkansas Department of Health's standards.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 1200.

3.9 HYDROSTATIC PRESSURE AND LEAKAGE TESTS

A. Testing shall begin within five (5) days after the completion of the installation of the water main (on a per main or per section/area basis). Once pressure testing is begun, it shall be vigorously pursued until complete. After the pipelines or isolated sections of the pipeline have been filled with water and air purged, the pressure shall be increased to the test pressure by means of a pump.

B. The CONTRACTOR shall furnish a pump and appurtenances as described in Section 34 herein. The OWNER will furnish the meter and pressure gauge after the CONTRACTOR has satisfied himself that the line will pass the test. The CONTRACTOR shall furnish all labor for conducting the tests.

C. The test pressure shall be 225 psi at the highest point of the pipeline segment being tested or as otherwise specified by the ENGINEER. All pipelines, service lines, and appurtenances shall be tested. The pressure test shall be documented and documentation shall be provided to the AE and the City of Batesville's water department for review and approval.

D. The duration of the hydrostatic leakage test shall be two (2) hours or as specified by the ENGINEER.

1. The duration of the hydrostatic leakage test on tapping sleeves/saddles shall be thirty (30) minutes at 225 psi with zero leakage.

E. The source of water for the pump suction shall be potable water from the OWNER'S distribution system. The vessel used must be approved by the ENGINEER.

F. All interior valves including guardian valves on fire hydrants and other appurtenances shall be open during all tests.

G. After the specified test pressure has been applied the entire pipeline shall be checked in the presence of the ENGINEER giving particular attention to that part of the pipeline and those appurtenances that are exposed.

H. If leaks are apparent, the CONTRACTOR shall, at his own expense, perform whatever work and/or replace whatever material that is required in order to remedy the defect and stop the leaks. All corrective work shall be approved by the ENGINEER.

I. After the CONTRACTOR has taken the necessary action to repair or replace any part of the pipeline or appurtenances where leaks were apparent or if no leaks were apparent, the pipelines shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

J. 1. The maximum leakage per hour for jointed pipe (ductile iron, PVC, concrete pipe, etc.) shall be as calculated from the following formula:

All rubber gasket or O-ring joints

$Q = LD \sqrt{P} / 148{,}000$

Q = Quantity of makeup water (gallons per hour)

L = Length of pipe section being tested (feet)

D = Nominal pipe diameter (inches)

P = Test pressure (psi); 225 psi or as specified by the ENGINEER

2. The maximum leakage per hour for non-jointed pipe (welded steel, welded PVC, welded HDPE, etc., and containing gasket-jointed connections for fittings, valves, etc.) shall be as calculated form the following formula:

$Q = ND \sqrt{P} / 7{,}400$

Q = Quantity of makeup water (gallons per hour)

N = Summation of mechanical and push-on gasket joints in length of pipe tested

D = Nominal pipe diameter (inches)

P = Test pressure (psi); 225 psi or as specified by the ENGINEER

3. The test pressure shall not vary by more than ± five (5) psi for the duration of the test. During the duration of the two-hour test, if the test pressure drops more than 5.0 psi from the start pressure, the test shall be terminated and considered failure due to assumed leaks in the tested pipe section. If the pressure rises beyond the allowed 5 psi variance, the test shall be terminated and remaining air shall be purged from the pipeline.

4. Upon completion of a two-hour test where the test pressure did not vary by more than ± five (5) psi, the CONTRACTOR shall determine the leakage amount by measuring the amount of “make-up” water necessary to restore the original starting pressure.

K. If any test of pipe laid discloses leakage greater than the allowable leakage as calculated from the above formula(s), the CONTRACTOR shall, at his expense, locate the leak or leaks and perform whatever work and/or replace whatever material that is required in order to remedy the defect(s) and stop the leak(s). All corrective work must be approved

by the ENGINEER. Tests on tapping sleeves/saddles must have zero leakage to be considered successful.

3.10 TEST PUMP

A. The CONTRACTOR shall provide a water pump for testing the mains hydrostatically. The pump shall have the following features:

1. Designed so that the required test pressures can be attained.
2. RESERVED
3. The pump discharge shall be equipped with the following, in the order listed from the pump outward (see CAW Standard Detail Sheet):
    a. Check valve arranged so as to prevent flow back toward pump.
    b. Adjustable pressure regulating device capable of maintaining discharge pressure at a constant level.
    c. Valved exhaust outlet.
    d. Section of flexible hose - length sufficient that ends of hose rests on ground.
    e. Outlet for pressure gauge. Outlet shall be equipped with valve and surge dampening device. Connection for gauge shall be 1/4" F.I.P. The pressure gauge will be furnished by the OWNER.
4. The pump suction shall be equipped with the following from the pump outward (see CAW Standard Detail Sheet):
    a. Suction pipe.
    b. Straight meter coupling - 1/2" M.I.P. x 5/8" Meter Nut.
    c. 5/8" meter - furnished by owner
    d. Straight meter coupling - 1/2" M.I.P. x 5/8" Meter Nut.
    e. End screen to prohibit entry of foreign matter if pump suction is connected to a vessel instead of on a water main.

B. The CONTRACTOR shall provide all other necessary connections for connecting pump from the suction source and to the main being tested.

3.11 FIELD QUALITY CONTROL

A. Perform pressure test on domestic site water distribution system in in accordance with the project specifications or City of Batesville’s standard specifications, whichever is more stringent.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

SECTION 33 1100 - WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for domestic water service connections to buildings.
2. Corporation stop assembly.
3. Curb stop assembly.
4. Meter setting equipment.
5. Water meters.
6. Backflow preventers.
7. Underground pipe markers.
8. Precast concrete vault.
9. Bedding and cover materials.

B. Related Sections:

1. Section 31 2000 – Earthwork.
2. Section 31 2116 - Trenching.
3. Section 33 1000 – Site Water Distribution
4. Section 33 1200 - Disinfection of Water Distribution

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:

1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

D. ASTM International:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
4. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.

5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
6. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
7. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
9. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
12. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

E. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
2. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
3. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
4. AWWA C702 - Cold-Water Meters - Compound Type.
5. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
6. AWWA C800 - Underground Service Line Valves and Fittings.
7. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
8. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.3 SUBMITTALS

A. Shop Drawings: Provide shop drawings for precast concrete vaults to include detail drawings showing the vault and accessories.

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meters, meter setting equipment, service saddles, backflow preventer, and accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the project specifications or City of Batesville's standard specifications – whichever is more stringent, City of Batesville's Fire Department, and the Arkansas Department of Health's standards and requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

D. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 WATER PIPING AND FITTINGS

A. Copper Tubing: ASTM B88 Type K annealed:

1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

2.2 CORPORATION STOP ASSEMBLY

A. Furnish materials accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Corporation Stops:

1. Brass or red brass alloy body conforming to ASTM B62.
2. Inlet end threaded for tapping according to AWWA C800.
3. Outlet end suitable for service pipe specified.

C. Service Saddles:

1. Double strap type, designed to hold pressures in excess pipe working pressure.

2.3 CURB STOP ASSEMBLY

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Curb Stops:

1. Brass or red brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.

2.4 METER SETTING EQUIPMENT

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

2.5 WATER METERS

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Provide meter as indicated on Drawings.

2.6 BACKFLOW PREVENTERS

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Reduced Pressure Backflow Preventers:

1. Comply with ASSE 1013.

2. Bronze body, with bronze internal parts and stainless steel springs.

3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

C. Double Check Valve Assemblies: Comply with ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.7 UNDERGROUND PIPE MARKERS

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Trace Wire: 12-gauge insulated copper wire, insulating jacket shall be a minimum of 30 mil polyethylene complying with ASTM-D-1248, 30 volt rating, brightly colored plastic covering, imprinted with "Water Service" in large letters.

2.8 PRECAST CONCRETE VAULT

A. Furnish materials in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

B. Product Description: Precast vault designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

C. Shape: As indicated on Drawings.

2.9 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on Drawings

B. Cover: As indicated on Drawings

2.10 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 32 0523.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION - CORPORATION STOP ASSEMBLY

A. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the Architect/Engineer.

B. Provide service clamps for mains other than of cast iron or ductile iron mains.

C. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12 inches apart longitudinally and staggered.

D. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.

E. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by the Engineer.

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 31 2116.

B. Backfill around sides and to top of pipe in accordance with Section 31 2000.

C. Maintain optimum moisture content of fill material to attain required compaction density.

D. Place fill material in accordance with Section 31 2000.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sewer in accordance with Arkansas Department of Health requirements and in accordance with the below:

1. All water mains are to cross over sewer mains with a minimum of 18-in of vertical separation and water and sewer mains shall have a minimum of 10-ft horizontal separation.
2. Where 18-in of separation cannot be achieved, the water or sewer main shall be encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing.
3. Where a water main must unavoidably pass beneath the sewer line, at least 18-in of separation must be maintained between the outside of the two pipes in addition to either the water or sewer main being encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing.

B. Route pipe in straight line.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints.

D. Install access fittings to permit disinfection of water system performed under Section 02516.

E. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

F. Establish elevations of buried piping with not less than 2.5 ft of cover.

G. Install trace wire continuous, buried 12 inches below finish grade, above pipe line; coordinate with Section 33 1000.

H. Backfill trench in accordance with Section 31 2116.

3.6 INSTALLATION - WATER METERS

A. Install Work in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

3.7 INSTALLATION - BACKFLOW PREVENTERS

A. Install backflow preventer where indicated on the Contract Drawings and in accordance with manufacturer's instructions.

B. Comply with City of Batesville's requirements and plumbing codes in regards to testing and installation requirements.

3.8 SERVICE CONNECTIONS

A. Install water service in accordance with the project specifications or City of Batesville's standard specifications, whichever is more stringent.

3.9 PRECAST CONCRETE VAULT

A. Construct valve vaults of precast concrete.

B. Seal vault joints watertight with preformed plastic joint sealant compound. Apply asphalt waterproofing to exterior walls.

C. Seal annular space between pipe and wall sleeves as indicated on the Contract Drawings.

D. Install vault covers and frames; adjust to finished grade elevation.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 1200.

3.11 FIELD QUALITY CONTROL

A. Perform pressure test on domestic site water distribution system in accordance with the project specifications or City of Batesvillewynne's standard specifications, whichever is more stringent.

END OF SECTION

SECTION 33 1200 - DISINFECTION OF WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution system; and testing and reporting results.

B. Related Sections:

1. Section 33 1000 - Site Water Distribution Product and Execution requirements for installation, testing, of site domestic water distribution piping.

1.2 REFERENCES

A. American Water Works Association:

1. AWWA B300 - Hypochlorites.
2. AWWA B301 - Liquid Chlorine.
3. AWWA B302 - Ammonium Sulfate.
4. AWWA B303 - Sodium Chlorite.
5. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
6. AWWA C651 - Disinfecting Water Mains.

1.3 SUBMITTALS

A. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

B. Test Reports: Indicate results comparative to specified requirements of the Arkansas Department of Health.

C. Certificate: Certify cleanliness of water distribution system meets or exceeds Arkansas Department of Health Standards

1.4 CLOSEOUT SUBMITTALS

A. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

B. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of the Arkansas Department of Health.

C. Water Quality Certificate: Certify water conforms to quality standards of the Arkansas Department of Health, suitable for human consumption.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the Project Specifications and City of Batesville's standards, whichever is more stringent.

1.6 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years of experience.
B. Testing Firm: Arkansas Department of Health

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping system has been cleaned, inspected, and pressure tested.
B. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 DISINFECTION REQUIREMENTS

A. Testing shall begin within five (5) days after the completion of the pressure testing of the water main (on a per main or per section/area basis). Blowoff and sample points shall be constructed by the CONTRACTOR as shown on the Plans or as directed by the ENGINEER. Fire hydrants shall be utilized as blowoff points whenever possible. Fire hydrants are not satisfactory for sample points. Openings for sample points shall be 1" copper riser pipe that extends well above the surface, as shown on the CAW Standard Details. A flushing plan shall be so designed so that all samples may be taken on each trip. The lines shall not be considered acceptable until two (2) consecutive samples taken twenty-four (24) hours apart are negative. Sampling may commence only Monday through Thursday. First samples may not be collected on Fridays, Saturdays, Sundays, and official holidays.
B. There are two acceptable methods of disinfecting: continuous feed method using liquid chlorine or calcium hypochlorite and the slug method using liquid chlorine or calcium hypochlorite. The slug method applies to large mains and shall be used only on approval of the ENGINEER. Liquid chlorine shall be used only when the CONTRACTOR has suitable equipment available and employees who are familiar with the physiological, chemical and physical properties and who are properly trained and equipped to handle any emergency that may arise. If, in the opinion of the ENGINEER, the equipment is inadequate or the personnel are not qualified, this method shall not be used.
C. When the continuous feed or slug method is to be used, the pipelines and appurtenances shall be thoroughly flushed prior to disinfecting. The flushing plan shall be approved by the ENGINEER. The ENGINEER may halt or reduce flushing if the distribution system pressures are reduced by the flushing operations.
D. The CONTRACTOR is reminded that chlorine is a powerful oxidant and reacts readily with foreign substances. All chlorine compounds shall be handled and stored in accordance with manufacturer's recommendations. Breathing of chlorine gas can be fatal. Hypochlorite solutions should not come into contact with skin or clothing. Containers used for mixing hypochlorite solution shall be clean and dry.

E. When the continuous flow method is used, the final concentration of chlorine inside the main shall be 50 parts per million. When the slug method is used, the concentration of chlorine entering the pipeline shall be at least 300 to 400 parts per million (ppm) and be of sufficient size/length to provide a minimum of two (2) hours of contact time as it flows through the pipeline. The strength/concentration of the slug shall be monitored as it flows through the pipeline and at no time shall it be allowed to drop below 100 ppm. If at any time the concentration of the slug nears 100 ppm, the flow shall be stopped, chlorination equipment shall be relocated to the head of the slug, and as flow resumes, chlorine shall be applied to restore the chlorine concentration of the slug to at least 300 ppm.

F. Calcium hypochlorite shall contain at least 60% available chlorine by weight in granular form.

G. When the continuous feed or slug method is used and the source of the chlorine is calcium hypochlorite, a solution of hypochlorite and water shall be prepared by mixing thoroughly in a suitable container. The mix shall contain one (1) pound of calcium hypochlorite per gallon of water. A suitable pump shall be provided for pumping this solution into the pipelines to be disinfected. This pump shall be equipped with a flow-measuring device.

H. When liquid chlorine is used, the equipment for injection shall consist of a solution feed chlorinator in combination with a booster pump for injecting the chlorine-gas water solution into the pipeline. Introduction of chlorine-gas directly from the supply cylinder shall not be permitted. The pump shall be equipped with a flow-measuring device.

I. During application of any chlorine solution, care shall be taken to assure that the solution does not flow back into the distribution system.

J. The procedure for disinfecting by the continuous flow method shall be as follows:

1. The flow through the pipeline and the solution flow shall be regulated so that the required concentration of chlorine is attained. The flow through the main shall be measured by using a pitot gauge or meter.
2. The introduction of the solution shall be continuous until the desired concentration is attained throughout the pipe line system. The concentration shall be checked by the Drop Dilution Method
3. After the required concentration has been attained all internal valves shall be operated in order to assure that the solution comes in contact with all appurtenances.
4. The solution shall remain in the pipe line system for twenty-four (24) hours after which the pipelines shall be thoroughly flushed. The chlorine concentration shall be checked before flushing. If the concentration is less than 25 parts per million, the disinfecting procedure shall be repeated if directed by the ENGINEER.

K. The procedure for disinfecting by the slug method shall be the same as the continuous flow method except that the flow rates shall be regulated so that the specified concentration of chlorine shall be in contact with all parts of the pipe line for at least two (2) hours.

L. Disinfecting by the tablet method is not allowed by the Arkansas Department of Health.

M. After final flushing, samples of water shall be collected from the sample points provided by the CONTRACTOR and tested by the OWNER. The CONTRACTOR shall provide any assistance required in collecting the samples.

N. If any of the samples collected are positive, the disinfecting procedures shall be repeated as directed by the ENGINEER until negative samples are collected. Only the continuous flow or slug method may be used.

O. The cost of water used for flushing after positive samples have been collected shall be deducted from amounts due the CONTRACTOR. The amount used shall be determined

by measurements of flow using a pitot gauge. Payment shall be based on the lowest prevailing water rate.

P. Payments to the CONTRACTOR (or DEVELOPER if a SPECIAL CONTRACT) shall be reduced by $30.00 per sample for each positive sample collected to cover the cost of collecting and testing the samples.

Q. Any chlorinated water release that would cause a chlorine residual above 0.10 ppm in a body of water containing any aquatic life forms shall be de-chlorinated as needed to prevent the resultant chlorine level from exceeding the 0.10 ppm limit. Chemicals used in the de-chlorination process shall not also produce other water qualities that would be harmful to the aquatic life forms in a receiving body of water; harmful water qualities such as, but not limited to, changes in pH, dissolved oxygen concentrations, etc.

R. Water draining from the sampling points and flushing shall be directed to adequate drainage structures so as not to create a nuisance and to avoid damage to other facilities, structures, and/or property. The CONTRACTOR shall be responsible for any damages.

3.3 FIELD QUALITY CONTROL

A. Disinfection, Flushing, and Sampling:

1. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
2. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

B. Bacteriological Tests:

1. After final flushing and before pipeline is connected to existing system, or placed in service, two sets of acceptable water samples collected from the new water line and taken on consecutive days shall be submitted by the Contractor to the bacteriological laboratory at the Arkansas Department of Health in Little Rock, Arkansas.
2. Samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater per the American Public Health Association, AWWA, and Water Environment Association (latest edition and shall show the absence of coliform organisms.
3. If samples collected are positive, the disinfecting procedures and samples shall be repeated until two consecutive day samples are tested safe.

END OF SECTION

SECTION 334111 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm drainage piping.
2. Accessories.
3. Underground pipe markers.

B. Related Sections:

1. Section 31 2000 – Earthwork: Backfill and compaction for structures and storm piping.
2. Section 31 2116 - Trenching: Execution requirements for trenching required by this section.
3. Section 32 0523 - Concrete for Exterior Improvements: Concrete type for catch basin base pad construction.
4. Section 33 0513 - Manholes and Structures.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
10. ASTM D1557 - Standard Test Method for Laboratory Compaction

Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D6938 - 10 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
18. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
19. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

A. Product Data: Submit data indicating pipe, pipe accessories, and appurtenances.

B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, catch basins, structures, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the City of Batesville’s applicable standards requirements.

1.6 COORDINATION

A. Coordinate the Work with termination of storm sewer connection outside building, trenching, and to the connection to municipal storm sewer utility service.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Polyethylene Pipe:

1. Piping and fittings shall be ADS N-12 ST IB pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.
2. Piping and fittings shall have a smooth interior and annular exterior corrugations.
3. Pipe shall be manufactured in accordance with AASHTO M252, Type S or SP for 4-inch through 10-inch diameter, and AASHTO M294 or ASTM F2306 for 12-inch through 60-inch diameter.
4. Pipe shall be joined using a bell and spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306. The joint shall be soil-tight and gaskets shall meet the requirements of ASTM F477.
5. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
6. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

B. Perforated Pipe for Underdrains:

1. Piping and fittings shall be perforated ADS single wall corrugated HDPE pipe as manufactured by Advanced Drainage Systems (ADS) of Hilliard, OH, or equal.
2. Perforations shall be Type B pattern as specified by ADS. Contractor shall obtain approval if perforation pattern other than Type B is to be used.
3. Perforated pipe shall be wrapped in geotextile fabric. Fabric shall be 4-oz non-woven geotextile fabric, Mirafi 140N or equivalent.

C. Reinforced Concrete Pipe:

1. Reinforced concrete pipe and flared-end sections: ASTM C 76, Type III, tongue and groove joints.
2. Joint material: cold-applied preformed plastic gasket type sealant conforming to ASTM C 443.

2.2 ACCESSORIES

A. Filter Fabric: Non-biodegradable, non-woven, 6 oz minimum weight.

B. Grout: Specified in Section 320523.

2.3 UNDERGROUND PIPE MARKERS

A. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Storm Sewer Service" in large letters.

2.4 CATCH BASINS

A. Refer to Section 33 0513 Manholes and Structures and as indicated on the Drawings.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on the Drawings.

B. Cover: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312116 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on bedding material as indicated on the Drawings.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

D. Place bedding backfill around pipe as indicated on the Drawings.

E. Install trace wire continuous over top of pipe buried 12 inches below finish grade, above pipe line.

F. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system.

3.5 INSTALLATION - CATCH BASINS AND STRUCTURES

A. Perform work in accordance with Drawings.

B. Refer to Section 330513, Manholes and Structures.

3.6 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION