Hight Jackson Associates

A Remodel & Addition

Benton County Detention Center

Bentonville, Arkansas

Project No. # 2404

PROPOSAL FORM

GENERAL CONDITIONS

SPECIFICATIONS

FOR FURNISHING LABOR AND

MATERIALS FOR:

CONSTRUCTION OF

A REMODEL & ADDITION
BENTON COUNTY DETENTION CENTER
BENTONVILLE, ARKANSAS

HIGHT JACKSON ASSOCIATES PA

ARCHITECT, A.I.A.

ROGERS, ARKANSAS

PROJECT #2404

JUNE 10, 2024

PROJECT MANUAL FOR CONSTRUCTION OF

A REMODEL & ADDITION
BENTON COUNTY DETENTION CENTER
BENTONVILLE, ARKANSAS

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INVITATION TO BID

PART 1 GENERAL

1.1 SEALED BIDS ADDRESSED TO:
Benton County, A Subdivision of the State of Arkansas
Benton County Administration Building
Properties Office
215 E. Central Ave, Suite 304
Bentonville, AR 72721
Attn: Shannon Maki

for the construction of a Remodel & Addition to Benton County Detention Center located on 1300 SW 14th Street, Bentonville, AR 72712

1.2 TYPE OF BID:
One proposal for the entire project including General Construction, Mechanical, Plumbing, and Electrical.

1.3. DEADLINE AND PLACE FOR RECEIPT OF BIDS:
July 11, 2024, at 2:00 PM local time.

Benton County Administration Building,
215 East Central, Ste. 304,
Bentonville, Arkansas

1.4. BID FORM AND SUBMISSION:
Forms furnished in this document. Submit in a clearly identified, sealed, opaque envelope.

1.5. CONSTRUCTION DOCUMENTS:
Drawings and Project Manual may be examined at the following locations:

HIGHT.JACKSON.ASSOCIATES.PA
5201 Village Parkway, Suite 300
Rogers, AR 72758
Phone: 479 464-4965
Fax: 479-464-8324

A & B Reprographics, Inc.
3204 Moberly Lane
Bentonville, AR 72712
Phone: 479-271-7922
Fax: 479-271-7948

Tri-State Area Contractors Association, Inc.
1216 Illinois Ave
Joplin, MO 64801
Phone: 417-627-9392
Fax: 417-621-0360

The Builders' Association
521 S. Ingram Mill
Springfield, MO 65806
Phone: 417-883-6044
Fax: 417-883-9403

Southwest Construction News
5031 S. 33rd West Avenue, Suite 200
Tulsa, OK 74107
Phone: 918-493-5066
Fax: 918-493-5069

1.6. PROCUREMENT OF DOCUMENTS:
Bona Fide General Contractors may obtain up to three (3) sets of Specifications and Drawings and Subcontractors may obtain one (1) set of Specifications and Drawings from the Architect's office upon deposit of $50.00 per set. Deposit checks to be made out to HIGHT JACKSON ASSOCIATES P.A. 100% of the deposit will be refunded to bidders who return the documents at least ten (10) days prior to the specified bid date if they do not intend to bid the project; or if a bona-fide bid is received, 100% of the deposit will be refunded upon return of the documents in good condition whether the bidder was successful in obtaining the work or not. **FAILURE TO BID OR RETURN THE DOCUMENTS IN ACCORDANCE WITH THE ABOVE INSTRUCTIONS WILL RESULT IN FORFEITURE OF THE FULL AMOUNT OF THE DEPOSIT.**

NOTE: BIDDERS ARE DISCOURAGED FROM DOWNLOADING BID DOCUMENTS FROM PLAN DISTRIBUTION OR PLAN REVIEW ROOM WEBSITES. IF BIDDERS CHOOSE TO DOWNLOAD BID DOCUMENTS, THEY MUST CONTACT HIGHT JACKSON ASSOCIATES AND GIVE BIDDER'S INFORMATION FOR RECORD PURPOSES. IT WILL BE THE BIDDER'S RESPONSIBILITY TO OBTAIN SUPPLEMENTAL INSTRUCTIONS OR ADDENDUMS PRIOR TO BID DATE.

PLEASE NOTE THAT ANY PERSON OR COMPANY INTENDING TO PROVIDE A PROPOSAL FOR THIS PROJECT SHALL NOTIFY THE ARCHITECT'S OFFICE AND LIST CONTACT INFORMATION

1.7. BIDDERS OPTION: As an option to a hard copy of drawings and specifications, Bidders may ask for drawings and specifications in pdf format at no charge.

1.8. The words vendor, bidder, offerer, company, proposer and contractor may be used synonymously in this document.

1.9. BID SECURITY:
Bid security in the amount of five percent of the Proposal must accompany each proposal in accordance with the "Proposal Procedures".

1.10. WITHDRAWAL OF BIDS:
No bid may be withdrawn for a period of thirty (30) days subsequent to date of the opening of proposal without consent of the Owner.

1.11. AWARD AND/OR REJECTION OF BIDS:
The Owner reserves the right to award the project in any manner that is deemed in his best interest, or to reject any or all bids and to waive any irregularities. Proposals which fail to comply fully with any provision of the Project Manual and other Contract Documents may be considered invalid and may not receive consideration.

1.12. In accordance with Act 150 of 1965, as amended, all bidders shall conform to requirements of the Arkansas State Licensing Law for contractors.

1.13. PRE-BID MEETING

A. A **MANDATORY** formal pre-bid meeting and walk-through of the project is scheduled as follows:
   1. **1300 SW 14th Street, Bentonville. AR 72712 on June 27, 2024, at 9:00 am local time**
   2. The purpose of this walk-through is to make all bidders aware of the extent of work to be performed and existing conditions. Bidders should make every effort to review drawings prior to this date and make note of questions about the full scope of work required in contract documents.
   3. Any bidders wanting to submit a bid for this project are required to attend this meeting.
   4. Bids that are submitted from a bidder that did not attend the **MANDATORY** pre-bid meeting will be rejected.

PART 2 NOT USED

PART 3 NOT USED

END OF INVITATION TO BID

SECTION 00 21 16

PROPOSAL PROCEDURE

PART 1 GENERAL

1.1 PROPOSAL INSTRUCTIONS

A. Should a proposer find discrepancies in, or omissions from the drawings, or documents, or should he be in doubt as to their meaning, he shall at once notify the Architect, who will send written instructions to all Proposers. Neither Owner nor Architect will be responsible for any oral instruction. Transmit pre-bid questions to Architect, using the RFI Form, found at the end of this Section. "RFI" will be answered and returned to bidder. If answer warrants change to contract documents during bidding, it will be listed in an addendum.

B. Proposals shall be made upon the PROPOSAL FORM (or exact copy thereof) found bound into these specifications. Fill in all blanks on the Proposal Form. Changes in the proposal must be explained or noted over the signature of the Proposer. Signatures shall be in longhand by a principal duly authorized to sign contracts, or an officer of the company legally authorized to sign all documents on behalf of the company. Proof of such authorization should be on file with Architect or be included with the bid form. If proposal is by a corporation, the signature shall be accompanied by the corporate seal impression. Proposals shall contain neither alterations nor recapitulation of work to be done.

C. No oral or telephonic proposals or modifications will be considered. No telegraphic proposals will be considered, but modification by telegraph of proposals already submitted will be considered if received prior to time set for proposal opening. All proposals received will be publicly opened and read aloud.

D. Any addenda issued during the time of preparation of proposals are to be acknowledged in the Proposal Form and in closing a contract; they will become a part thereof.

1.2 SUBMISSION OF BID

A. Before submitting his proposal, each Proposer shall carefully examine all documents pertaining to the work, shall visit site and fully inform himself as to all existing conditions under which the work will be performed. Submission of a proposal will be considered presumptive evidence that the Proposer is fully aware of the conditions of the work, requirements of the Contract Documents, pertinent state and local codes, conditions of labor and material markets, and has made allowances in his proposal for all work and all contingencies.

B. Bids must be submitted on or before the date and time specified for bid opening to the place of receiving indicated on Proposal for Lump Sum Contract form. Each bid is to be placed in a separate opaque envelope, completely and properly identified, including the following information:
   PROPOSAL FOR (State category of the Work)
   NAME OF PROJECT
   PROJECT NUMBER
   ADDRESS OF PROJECT
   BID OPENING DATE AND TIME
   NAME OF BIDDER
   STATE CONTRACTOR'S LICENSE NUMBER

C. Enclose along with the proposal, the required proposal security.

D. Deliver proposal to the place of receiving indicated on Proposal for Lump Sum Contract.

E. Late bids will not be considered under any circumstances

F. Failure to sign bid will result in disqualification. The person signing the bid should show title or authority to bind his/her firm to a contract. The signature must be in ink. The bid must be completed in ink or typed.

1.3 PROPOSAL SECURITY

A. Proposal Security, consisting of a bid bond, certified check or cashier check on a solvent bank, must be enclosed with each proposal in the amount of not less than five percent (5%) of the largest combined Bid in his Base Proposal. **Bid bond, certified check or cashier check are to be originals. No copies will be accepted.**

B. Proposal Security shall be made payable, without condition, to Benton County, A Subdivision of the State of Arkansas, as a guarantee that the bidder, if awarded the contract, will promptly execute the formal contract in accordance with the proposal and as required by other Contract Documents, and that he will furnish good and sufficient bonds for the faithful performance of same. Proposal Securities of the three lowest bidders in each category of work will be retained until the contract is awarded or other disposition is made thereof. Proposal Security of all bidders shall be returned promptly after the canvas of proposals.

C. Performance Bond and Labor and Material Payment Bond, Statutory Bond, will be required in an amount of 100% of the contract amount. Such bonds shall be in such a form as required by the Owner and with such sureties as the Owner may approve.

D. Furnish Owner, through the Architect, with two (2) copies of the signed "Contractor's and Resident Local Agents Affidavit of Qualification" found at the end of this section. *(This form is not required until award of contract.)*

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E. Performance Bond, Labor & Material Payment Bond, and Contractor's Resident Local Agents Affidavit of Qualification shall not be required for submittal prior to bidding but will be required prior to signing of contract.

F. Copies of the Contract Form and approved Bond Forms may be inspected at the Architect's office.

1.4 LICENSING / BIDDING REQUIREMENTS

A. Contractor is required to meet all state laws concerning bidding requirements in the state for which the job is being constructed. Each Contractor is required to have a Contractor's License according to the Contractor's Licensing Act of the Arkansas State Licensing Law for Contractors. The Contractor shall indicate on his bid, his current license number as issued by the Contractor's Licensing Board. The license must be current day of bidding and throughout length of project.
   1. Proposals must be submitted in compliance with requirements of Arkansas State Contractor's Licensing Law. Bidders who submit proposals in excess of $50,000 must submit evidence of having an Arkansas State Contractor's license before their bids will be considered.

B. Subcontractor licensing in the State of Arkansas.
   1. Subcontractors who submit proposals more than $50,000.00 must have a current Arkansas State Contractor's License.
      a. As a condition to performing construction work for and in the State of Arkansas, all prime contractors shall use no other subcontractors when the subcontractors' portion of the project is Fifty Thousand Dollars ($50,000.00) or more, except those licensed by the Contractors Licensing Board and qualified in:
         1. Mechanical, indicative of heating, air-conditioning, ventilation, and refrigeration.
         2. Plumbing.
         3. Electrical, indicative of wiring and illuminating fixtures; and
         4. Roofing and sheet metal work, indicative of roofing application.
      b. In the event the prime contractor is qualified and licensed by the Contractors Licensing Board, he may use his own forces to perform those tasks listed in this section as subcontractors in one (1) or more of the trades listed.

   2. The prime contractor shall place the names of each subcontractor in a blank space to be provided on the Form of Proposal of his bid. It shall be mandatory that the a) mechanical, b) plumbing, c) electrical and d) roofing and sheet metal subcontractors named on the Form of Proposal by the prime contractor awarded a contract under the provision of this Act be given contracts by the prime contractor in keeping with their proposals to perform the items for which they were named. **If the prime contractor is performing the work for the trade listed, they must list their own company in the space provided.**

C. Your attention is called to the state law(s) requiring all specialty contractors bidding as subcontractors must be licensed by the State of Arkansas. Also, they must be licensed the day they bid the project.

1.5 TRENCHING AND EXCAVATION SYSTEMS

A. Act 291 of 1993 requires the inclusive in all bids for public works projects a separate price pay item for trench or excavation safety systems if trench or excavation which equals or exceeds five (5) feet in depth, the agency, county, municipality, school district, local taxing unit or improvement district shall require before an award of the contract. Failure to do so, the agency, etc., shall declare the bid fails to comply fully with the requirements and shall be deemed invalid as a non-responsive bid. You must make an entry on the Bid Form in the place provided in order for your bid to be considered a qualified bid. If trenching is not required, show as $0.00 Dollars in space provided on proposal form. **You must make an entry on the proposal form in the space provided in order for your bid to be considered a qualified bid.**

1.6 AWARD OF CONTRACTS

A. Contract will be awarded as soon as possible to the responsible Proposer submitting the lowest acceptable proposal provided.
   1. Evidence of the experience qualifications and financial responsibility of the bidder and his subcontractors, and the time of completion are all acceptable to the Owner.
   2. The total of acceptable proposals is within the financial budget for the project.
   3. The Owner reserves the right to reject any or all proposals, and to waive all technicalities concerning the proposals received when it may be in his best interest to do so.

1.7 TIME OF COMPLETION

A. The Contractor is to insert number of Calendar Days to complete project in space provided on Proposal Form.

   The Undersigned further agrees that, from the compensation otherwise to be paid, the Owner may retain the dollar amount as listed on the Proposal Form for each day thereafter that the Contract remains incomplete, as defined in Article. 9.8 of the General Conditions of the contract, which sum is agreed upon as the proper measure of liquidated damages which the Owner will sustain per diem by the failure of the Undersigned to complete the work at the time stipulated, and this amount is not to be construed as in any sense a penalty.

1.8 CONTRACT

A. If he be notified of the acceptance of his proposal within thirty (30) calendar days of the time set for opening of proposals, the Undersigned agrees to execute a contract for the above work for the above stated compensation in the form of the Standard Form of Agreement between Owner and Contractor, Document No. A101, as issued by the

American Institute of Architects, current edition within seven (7) calendar days of the receipt of such notification.

1.9 OBLIGATION OF BIDDER

A. At the time of opening of bids each Bidder will be presumed to have inspected the site and the means of access and transportation required, and to have read and to be thoroughly familiar with the Drawings, Specifications, bidding documents and contract documents, including all Addenda. The failure or omission of any Bidder to examine any form, instrument or document, or to inform himself of conditions relating to the construction of the project, shall in no way relieve any Bidder from any obligation in respect to his bid.

B. ALL CONTRACTORS MUST BE LICENSED ON THE DAY OF THE BID SUBMITTAL.

1.10 QUALIFICATIONS OF BIDDER

A. Contractor Pre-qualification: Contractor shall be a recognized general contractor, skilled and experienced in the type of construction required, and equipped to perform workmanship in accordance with recognized standards. Include completed AIA Document A305 (copy available at Architect's office) with proposal. Contractor will not be required to provide Pre-qualification Document A305 if he has performed and completed work of similar size and nature for a project designed and administrated by Hight Jackson Associates within the past Three years.

B. Owner may make such investigations as he deems necessary to determine the ability of Bidder to perform the work and Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. Owner reserves the right to reject any bid if evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

1.11 LAWS AND REGULATIONS

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

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

1.12 SITE VISITS

A. Walk thru of the existing area of work will follow pre-bid meeting. Any additional visits to the site may only be made by appointment with the Facilities Administrator, Bryan Beeson, 479-271-1096.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

CONTRACTOR'S AND RESIDENT OR NON-RESIDENT LOCAL AGENT'S

AFFIDAVIT OF QUALIFICATIONS

Comes now _____ , hereinafter called "CONTRACTOR" and _____ hereinafter called "RESIDENT OR NON-RESIDENT LOCAL AGENT", and after being duly sworn states under oath and under penalty of perjury that they have independently examined the status of the bonding company providing the performance bond for the contract entered into between CONTRACTOR and BENTON COUNTY, A SUBDIVISION FO THE STATE OF ARKANSAS, on the_____ day of _____, 20_____ , and state that each has independently examined the status of the proposed bonding company and states that the proposed bonding company is qualified and authorized to do business in the State of Arkansas.

The RESIDENT OR NON-RESIDENT LOCAL AGENT further affirms that he is licensed by the Arkansas Insurance Commissioner to represent the surety company executing the bond and files herewith the agent's power of attorney as his authority.

FURTHER AFFIANTS SAITH NOT.

_____ _____

CONTRACTOR RESIDENT LOCAL AGENT

REQUEST FOR INFORMATION FORM

SUBMIT TO: HIGHT JACKSON ASSOCIATES PA
5201 W. VILLAGE PARKWAY, SUITE 300
ROGERS, AR 72758
PHONE: (479) 464-4965
Email: lsmith@hjarch.com

PROJECT: A Remodel & Addition for Benton County Detention Center, Bentonville, AR

PROJECT #: 02404

RFI # _____ DATE SUBMITTED: _____

REQUIRED ANSWER DATE: _____

REQUESTING CONTRACTOR'S NAME: _____

Requesting Contractor's email address or fax #. _____

All requests must include the associated reference such as drawing #, spec section, room #, column line location, etc.

REFERENCE:

REPLY:

NAME: Lorrie Smith DATE:_____

CC: RFI file

00 42 13
PROPOSAL FOR LUMP SUM CONTRACT

PLACE: Benton County Administration Building, 215 E. Central Ave,
Suite 304, Bentonville, AR 72712

DATE & TIME July 11, 2024 at 2:00 PM local time

PROJECT: A Remodel & Addition, Benton County Detention Center, Bentonville, AR

PROPOSAL OF

(Hereinafter called the "Bidder")

A Corporation, organized and existing under the laws of the State of _____

A Partnership consisting of _____

An individual trading as _____

TO: BENTON COUNTY, A SUBDIVISION OF THE STATE OF ARKANSAS

Gentlemen:

The undersigned, in compliance with your invitation for bids for the construction of A Remodel & Addition for Benton County Detention Center, Bentonville, AR, having examined the plans and specifications with related documents, and having visited the site of the proposed work within the past Fourteen (14) days, and being familiar with all the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby propose to furnish all labor, materials, supplies, etc., and to construct the project in accordance with the contract documents within the time set forth therein and at the prices stated herein, to cover all general construction work, including plumbing, mechanical and electrical. These prices are to cover all expenses incurred in performing the work required under the contract documents of which this proposal is a part.

I/We acknowledge receipt of the following Addenda:
(Arkansas public bid statutory requirement: Bidder must acknowledge all addenda issued by addendum number)
#_____ Dated_____
#_____ Dated_____
#_____ Dated_____

Base Bid Proposal for General Construction:

DOLLARS ($)

(Arkansas public bid statutory requirement: Bidder must enter bid amount in numerical format)

In compliance with Act 291 of 1993 the following separate pay item is included in the base bid:
TRENCHING OR EXCAVATION SAFETY SYSTEMS:

DOLLARS ($)

(Arkansas bidding law requirement: Bidder must enter amount. If amount is $0.00, then enter amount as $0.00)

UNIT PRICES:

UNIT PRICE NO. 1: Rock excavation and off site disposal per Specifications, Section 31 23 00.

DOLLARS per cu.yd.in place ( )

UNIT PRICE NO. 2: Provide, place & compact engineered fill as specified in Section 31 23 00.
(Price shall also be for credit if fill called for is not required as determined by soils engineer)

DOLLARS per trucked cu.yd.( )

UNIT PRICE NO. 3: Excavation, removal and off site disposal of existing earth.
(Price shall also be for credit if earth removal called for is not required as determined by soils engineer)

DOLLARS per trucked cu.yd.( )

COMPLETION TIME: The Contractor agrees, if awarded the contract to complete project within *(insert number of calendar days)* _____
( ) Calendar Days after the date noted in Contract.

Liquidated damages in the amount of Five Hundred Dollars ($500.00) per calendar day for delay beyond that time will be paid by the Contractor except for extensions of time granted under the General and Supplementary Conditions.

In submitting this bid, it is understood that the right is reserved by the Owner to reject any or all bids. No bid shall be withdrawn for a period of thirty (30) days subsequent to the opening of bids without the consent of the Owner.

In submitting this bid I/We acknowledge and include Cash Allowance costs as part of the Base Bid as listed in Specification Section 01 21 13.

I (or we) submit the names of the subcontractors I (or we) propose to use, and the State Contractors' License Number (If Applicable), as follows:

	SUBCONTRACTORS NAME	STATE CONTRACTOR'S LICENSE NO.
A.	Plumbing	

Is the amount of the Plumbing work $50,000.00 or more? Yes____ No_____
If yes, list plumbing subcontractor and license number above.

B. Mechanical

Is the amount of the Mechanical work $50,000.00 or more? Yes____ No_____
If yes, list mechanical subcontractor and license number above.

C. Electrical

Is the amount of the Electrical work $50,000.00 or more? Yes____ No_____
If yes, list electrical subcontractor and license number above.

D. Roofing & Sheet Metal

Is the amount of the Roofing & Sheet Metal work $50,000.00 or more? Yes____ No_____
If yes, list roofing and sheet metal subcontractor and license number above.

Item A. and B. may be separate or combined under one mechanical contract, if so stated above.
(Arkansas public bid statutory requirement: Bidder must enter subcontractors name in blanks above along with license number unless amount of subcontract is less than $20,000.00.)

CONDITIONS:

A. It is agreed that if awarded the Contract, a period of time not to exceed thirty (30) days shall be allowed the Owner in which to determine the manner in which to award or not award the contract.

B. It is further agreed that if awarded the contract, the undersigned will execute the contract and commence work within Seven (7) calendar days, and will fully complete the work ready to use, not later than the time stipulated.

DECLARATION:

A. The Undersigned hereby declares that he has carefully examined the Invitation and Instructions for Proposals, the Drawings and Specifications, has visited the actual location of the work and has consulted his sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to pleas of any misunderstanding regarding the same.

B. It is mandatory to attend a formal pre-bid meeting and walk-through of the project at the date and time as listed in Section 00 11 16 “Invitation to Bid” and that the bidder familiarize himself/herself with the site/existing building, review existing conditions, and that his bid reflects same.

FIRM

BY

(Arkansas public bid statutory requirement: Bidder must sign in space provided above)

PRINTED NAME & TITLE

TITLE

DATE

NOTE: If bidder is a corporation, indicate state of incorporation, under the Firm's Signature, and if a partnership, give full names of all partners.

Arkansas State Contractor's License No.

(Arkansas public bid statutory requirement: Bidder must provide current State Contractor's number)

SECTION 00 72 00

GENERAL CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work included under these Specifications consists of furnishing all items, materials, operations, or methods listed, mentioned, indicated, or scheduled on the drawings and/or in these Specifications, including all labor, materials, equipment, transportation, temporary facilities, services and incidental necessary and required for the construction and completion of the project named in the title page in accordance with contract documents.

1.2 FORM OF SPECIFICATIONS

A. General Conditions and Division 1 (General Requirements) apply to every Division (1 through 33 of these Specifications.

B. These Specifications are of abbreviated form and contain incomplete sentences. Omissions of words or phrases such as “the Contractor shall” “shall be”, “as noted on the drawings”, “according to the drawings”, “a”, “an”, “the”, and “all” are intentional. Omitted words and phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the drawings.

C. All specification instructions are directed to the Contractor and the inclusion of any work by mention, note, or itemization, however brief, implies the Contractor shall provide same, unless specifically directed otherwise. Where a specific Contractor is named, he shall be responsible for and provide work so designated.

D. In specifying an item by manufacturer’s name and/or catalog number, such item is to be provided complete with all the standard devices and accessories as indicated in the latest edition of the manufacturer’s catalog or brochure published at date of invitation to submit proposal, unless specifically stated otherwise.

1.3 AIA GENERAL CONDITIONS

A. AIA Document A201-2017:
“GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION”, 2017 EDITION, 15 Articles, hereinafter referred to as the “AIA General Conditions’, is hereby made a part of this specification, a copy of which is herein attached. Contractor shall consult this document and become intimately familiar with its contents before submitting his proposal.

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

(Paragraphs deleted)

TABLE OF ARTICLES

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

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

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

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

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

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

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such

procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents

with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of

Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to 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 dispute resolution proceedings but, in such event, mediation shall proceed in advance of 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. § 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for dispute resolution. If such a demand is made and the party receiving the demand fails to file for dispute resolution within 60 days after receipt thereof, then both parties waive their rights to dispute resolution proceedings with respect to the initial decision.

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

(Paragraphs deleted)

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,date not known at this time)

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

A Remodel & Addition
Benton County Detention Center
Bentonville, AR

THE OWNER:
(Name, legal status and address)

Benton County, A Subdivision of the State of Arkansas
Bentonville, AR 72712

THE CONTRACTOR:
(Name, legal status and address)

To be determined

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, , 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.

§ 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.*

§ 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.

NOTE: Builders Risk Policies commonly include some kind of occupancy exclusion. Agents would need to have that removed if the building is going to be occupied at any time during construction. EITHER INCLUDE OR ADVISE OWNER TO DISCUSS WITH INSURANCE.

THE CONTRACTOR SHALL MAINTAIN BUILDERS' RISK INSURANCE AND SHALL FILE CERTIFICATES OF INSURANCE WITH THE OWNER AS REQUIRED. The limits of such insurance shall be not less than the following:

1. Property Insurance (Builders' risk shall be purchased and maintained by the Contractor. Furnish Owner with a copy of the policy. Contractor shall notify Owner at least 15 days before policy is terminated.

§ 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.

(Paragraphs deleted)

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.3.1.4 Waiver of Subrogation the Commercial General Liability and Automobile Liability policies shall each contain a waiver of subrogation in favor of the Owner, Architect, and their officers, directors, Board Members, employees and agents.

§ A.3.1.5 Subcontractors, Contractor shall cause each subcontractor to purchase and maintain insurance of the types and amounts specified as a minimum. Limits of such coverage may be reduced only upon written agreement of Owner. Contractor shall provide to the Owner copies of certificates evidencing coverage for each subcontractor. Subcontractor's commercial general liability and business automobile liability insurance shall name Owner and Architect as additional insured and have the Waiver of subrogation endorsement added in accord with Article A.3.

§ A.3.1.6 These certificates and the insurance policies required by this Article A.3 shall contain a provision 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. 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 in accordance with the Contractor's information and belief.

§ A.3.1.7 Failure to file certificates or acceptance by the Owner or Architect of certificates of insurance which do not indicate the specified coverage shall in no way relieve the contractor of his responsibility for maintaining insurance as specified above.

§ 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 One Million Dolla ($ 1,000,000.00) each occurrence, Two Million Dollars ($ 2,000,000.00) general aggregate, and Two Million Dollars ($ 2,000,000.00) 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 One Million Dollars ($ 1,000,000) 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 ($ 1,000,000.00) each accident, One Million Dollars ($ 1,000,000.00) each employee, and One Million Dollars ($ 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 One Million Dollars ($ 1,000,000.00) per claim and One Million Dollars ($ 1,000,000.00) in the aggregate.

§ A.3.2.9 Contractor shall procure Pollution Liability insurance, with policy limits of not less than One Million Dollars ($ 1,000,000.00) per claim and One Million Dollars ($ 1,000,000.00) in the aggregate.

(Paragraphs deleted)

§ 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.)

[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
(Paragraphs deleted)

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.

§ A.3.4 Revised Language:
Contractor shall pay premium for and furnish Two (2) copies of a Performance Bond, and a Labor and Material Payment Bond in full amount of the contract sum to cover faithful performance of the contract and payment of all obligations arising thereunder, within seven (7) calendar days after signing contract. Furnish bonds in accordance with application laws of the State of Arkansas. Labor and Material Payment Bond coverage for project shall be maintained for a period of not less than one (1) year after substantial completion. A Warranty Bond shall be furnished in full amount of the contract sum to cover faithful performance of the contract and payment of all obligations for an additional year beyond Labor and Material Payment Bond coverage.

§ A.3.4.1 Furnish Owner, through the Architect, with two (2) copies each of required bonds.

§ A.3.4.2 Furnish Owner, through the Architect, with two (2) copies of the signed "Contractor's and Resident Local Agents Affidavit of Qualification, attached.

§ A.3.4.3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

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

None

SECTION 00 73 00

SUPPLEMENTARY GENERAL CONDITIONS

PART 1 SUPPLEMENTARY GENERAL CONDITIONS

1.1 GENERAL

A. Where any Articles of the AIA General Conditions Document A201-2017 are supplemented hereby, the provision of such Articles remains in effect with supplemental provisions added thereto. Where any Article is amended, voided or superseded hereby, the provisions of such article that are not so amended voided or superseded remain in effect.

B. Where provisions of the General Conditions relate in general to the work of the Contractor and Subcontractor, these paragraphs are modified in Division 1, GENERAL REQUIREMENTS of the specifications.

C. Should conflict occur between these Special Provisions and the General Conditions, the requirements of the Special Provisions shall take precedence.

PART 2 AMENDMENTS TO THE GENERAL CONDITIONS

ARTICLE 1 GENERAL PROVISION

Add the following paragraphs:

1.1.7.1 Contractor who is awarded the project will be furnished free of charge the following number of sets of working drawings and specifications, including all modifications thereof:

General Contractor	3 sets
Mechanical Contractor	2 sets
Electrical Contractor	2 sets
Plumbing Contractor	2 sets

1.1.7.3 Accompanying these Specifications are Drawings, which jointly with these Specifications are intended to explain each other and describe and coordinate the work to be performed under Contract.

Add the following paragraphs:

1.2.2.1. The Specifications are divided, and the Drawings are numbered, each under headings set forth in the Specifications Index and in the Enumeration of Drawings below, such headings indicating the division of responsibility between contracts. The General Contract includes all work indicated under the headings CIVIL, ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING. However, the divisions created by the above headings shall not alleviate any contractor or

subcontractor from work to be performed by him that is specifically indicated by the Drawings or in the division of Specifications of other contracts, for each contractor shall fully familiarize himself with all of the drawings and specifications for this project before submitting his proposal.

1.2.4. Should a discrepancy be found among the contract documents, request interpretation from the Architect, before proceeding with the work. Should an error, inconsistency or omission later be found in the drawings or specifications, or between drawings and specifications, or between drawing divisions, Contractor is deemed to have estimated on the more expensive way of doing work unless he shall have asked for and obtained a written decision before submission of proposal as to which method of materials will be required. Contractor shall notify Architect if any of these situations occur, and gain approval before proceeding. Reference used in these specifications to the Architect shall mean Hight-Jackson Associates PA.

1.2.5. Before submitting his proposal, each bidder shall check his set(s) of Specifications and Drawings and advise the Architect if any sheets are missing.

1.2.6. Do not scale drawings for dimensions. Accurately lay out such work from dimensions indicated on architectural drawings unless such is found in error. Consult Architect for any interpretations concerning locations of equipment.

1.2.7. If there is a discrepancy between drawings and specifications, consult Architect for clarification. Otherwise the more stringent requirement shall take precedent.

1.2.8. Consult Drawings for miscellaneous items of each trade and provide same as indicated.

Add the following paragraphs:

1.4.1 When a word, such as “approved”, “proper”, “satisfactory”, “alternate”, and “as directed” is used, it implies such reference is to the architect’s specific approval and directions.

1.4.2 “Provide” means furnish and install.

Edit the following paragraph:

1.7 Digital Data Use Transmission, revise AIA Document E203-2013 to C106-2013

Delete the following paragraph:

1.8 Building Information Models Use and Reliance to be deleted in its entirety.

ARTICLE 2 OWNER

Add the following sentence:

2.3.2 Paragraph 2.3.2 is modified with the following addition: Where the word "Architect" appears in each Division of the Specifications, it refers to the Architect or to the Owner as applicable

ARTICLE 3 CONTRACTOR

Add the follow subparagraphs:

3.3.4 Contractor notify his Subcontractors, Owner, and all Contractors and Subcontractors under the Owner when he is ready for them to install their portions of the work and see that they comply with any reasonable period of time. Neither enclose nor cover any piping, wiring ducts, equipment or other items until proper tests and inspection have been made by Architect and/or proper authorities.

3.3.5 Notify Architect to inspect any work when placing of subsequent work would prevent observation of previous work.

3.3.6 Contractor shall take charge of and assume general responsibility for proper protection of building during construction. He shall further provide substantial enclosures at all openings as necessary for protection, including doors with locks.

3.3.7 Each Contractor assumes responsibility for his materials stored on the premises.

3.4.1 ORDERS FOR MATERIALS. Paragraph 3.4.1.is modified with the following additions:

3.4.1.1 Place material orders immediately following materials submittal approval. Furnish evidence of orders to Architect upon request.

3.4.1.2 Place orders contingent upon selection of colors and finishes, approval of shop drawings and samples by Architect.

3.4.1.3 Include with monthly request for payment and progress schedule a report of materials purchased and date materials are scheduled for delivery.

Add the following paragraphs:

3.4.2 Paragraph is modified with the addition: Proposals for substitutions of material, equipment, or methods shall be submitted no later than thirty days from date of written Notice to Proceed, authorizing performance of the Contract. Include a list of all materials, which he proposes to substitute for materials specified. Proposals for substitution shall be accompanied by such technical data, as the Architect may need in order to compare the proposed material with the material that was specified. No

substitutions shall be made until written permission is given by the Architect at the direction of the Owner.

3.4.4 Where a material is mentioned in the Specifications by trade name or manufacturer's name, the same is not preference for said material, but the intention of using said name is to establish a type of quality of material. Material of other trade names or of other manufacturers which is in the opinion of the architect, equivalent or better in type or quality will be accepted by the Architect on behalf of the Owner only as provided in Section 01 60 00.

3.4.5 Before submitting proposal, Contractor, his Subcontractors and Material Suppliers observe Drawings and Specifications, and should any material and/or its installation be indicated or specified in a manner not approved by the Material Manufacturer, or specified item has been discontinued, notify Architect and receive his instructions. The Contractor shall provide other equivalent materials suitable for the installation as selected by the Architect, or if not discovered until after installation. Contractor shall replace materials with such other equivalent suitable and selected materials, and in either event, at no added cost to Owner.

Add the following paragraphs:

3.5.1.1 Warranty all work to be free from defects in materials and workmanship for a period of one year from the date of Substantial Completion, except where a different time period is specifically prescribed. Contractor will promptly correct such defects to the state of condition originally required by the contract documents at contractor's expense.

3.5.1.2 Warranty period for all equipment and material shall not begin until the date of Substantial Completion. Contractor will promptly correct such defects to the state of condition originally required by the contract documents at contractor's expense during the warranty period.

3.5.2.1 When, at any time during the warranty period, work is considered defective by either Owner or Architect, immediately:

A. Place such defective work into a satisfactory condition, free from faults and defects and in conformance with contract requirements.

B. Make good all damage to work, including contents thereof and grounds, developing within warranty period when such damage is due to use of materials and labor not conforming to contract requirements.

C. Make good all work disturbed in fulfillment of contract obligations during warranty period. If work of other contractors is disturbed in the process of fulfilling contract, restore such work to its original condition and warranty such restored work.

3.5.3 Upon failure by contractor to proceed promptly to comply with terms of any warranty under the contract, Owner shall have such work performed as necessary to fulfill warranties, and contractor shall pay Owner such sums as expended to fulfill such warranty.

3.5.4 Work required for fulfillment of warranties embraced under the contract shall be performed at no additional expense to Owner.

3.5.5 Unless other specifically prescribed in warranty, normal wear and tear and results of accidents not chargeable to contractor are excluded from the requirements of this Article.

3.5.6 Prior to expiration of the one-year warranty period, the Architect will conduct an inspection of the project and create a punch list for items found to be deficient. Contractor will be required to be present. The Architect will set a date by which the deficient items are to be corrected. Contractor will return punch list to Architect, initialing completed each completed item. Note that contractor will remain responsible for repair and or replacement of items with warranties extending beyond one year as called for in individual specification sections or on drawings.

Add the following paragraph:

3.6.1 Materials and equipment incorporated into this project will be required to follow the Guidelines of Arkansas Sales Tax and such taxes shall be included in bidder's proposals. Contractors shall include Social Security Taxes, State Unemployment compensation Insurance and all other items of like nature.

Add the following paragraphs:

3.9.1.1 The superintendent shall be employed as full time and be in attendance at the project site during performance of the work. Superintendent shall have a minimum of 10 years of construction experience. Five (5) years of that experience shall have been in the capacity of a project superintendent on similar type projects. If the superintendent is unknown to the Architect, a resume shall be submitted for review and approval to qualify in this capacity. The Owner retains the right to accept or reject proposed superintendent prior to signing of contract. General Contractors not having such a person available for the project are discouraged from bidding project.

3.9.4 The superintendent assigned to the project at the beginning of construction will remain as superintendent for the entire duration of construction period. The superintendent shall provide duties per general conditions and remain on site for the entire duration of the project, including completion of all punch list items. The only circumstances that would permit replacement of the superintendent are prolonged illness, resignation of the superintendent from the company, or death. If one of the preceding circumstances should occur, the Contractor shall state in writing to the Owner the reason for replacement, send qualification statement of the proposed project superintendent, and

obtain approval from the Owner and Architect. The replacement superintendent shall possess the minimum requirements set forth in paragraph 3.9.2.

3.15.1.2 The Contractor shall replace broken or scratched glass, clean fixtures, remove dust, dirt, spots, marks, labels, stains, foreign paint and other blemishes from all finish work, unless more exactly specified, clean all floors and floor coverings, clean and polish hardware.

ARTICLE 4. ARCHITECT

4.1.1 Paragraph 4.1.1 is modified with the following addition: Where the word "Architect" appears in each Division of the Specifications, it refers to the Architect or to the Owner as applicable.

ARTICLE 5. SUBCONTRACTORS

Paragraph 5.2.2 of the General Conditions Add the following:

5.2.2.1.1 Submit list of proposed subcontractors to Architect prior to, or at time of pre-construction conference. Subcontractors listed shall not be released from their contract or replaced without notification and approval of Owner.

ARTICLE 6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

Add the following paragraph:

6.2.6 Contractor shall assume general coordination and direction of the project. Each Contractor shall cooperate with other Contractors on the Work and install his work in sequence to facilitate and not delay the installation of such other contractors. The Architect is neither the coordinator nor the expediter of the work of the various contractors.

ARTICLE 7. CHANGES IN THE WORK

7.3.3 Delete in its entirety and substitute the following:

7.3.3 The value of any extra work or change performed by Contractor using his own forces shall be determined in one or more of the following ways:

1. By estimate and acceptance of a lump sum, computed as follows:
   a. Net cost of materials.
   b. State and local sales tax.
   c. Net placing cost.
   d. W.C. insurance premium and FICA tax.
   e. Overhead and profit, 15% x (a + b+ c + d).
   f. Allowable bond premium.
   g. Total Cost = a + b + c + e + f.

Credit for work omitted, which was included in original contract, shall be computed on the same basis, except that Contractor may retain 7% of overhead and profit percentage, computed on above basis.

2. By unit prices named in contract or subsequently agreed upon. (Unit price will include contractor's profit and overhead, insurance and bond, and quantification of amount of material by third party.)

3. By cost and percentage or by cost and a fixed fee, to be computed according to above formula.

Contractor shall be required, if called upon, to furnish original bills and payrolls and support of statement with proper affidavits. Burden of proof of costs rests upon Contractor.

Add the following paragraph:

7.3.3.1 The value of any such extra work or change performed by a subcontractor shall be determined by the subcontractor computing his cost as outlined in subparagraph 7.3.3 (a. through e.), to which cost the Contractor shall add an overhead and profit charge of 5% plus allowable bond premium.

ARTICLE 8. TIME

8.1.2 Delete: "The date of commencement of the Work is the date established in the Agreement" and add the following:
Add: "The date of commencement of the Work is the date established in the written Notice to Proceed. Do not begin work prior to receipt of written Notice to Proceed authorizing performance of the contract. The official Notice to Proceed will be issued by the Owner."

8.3.1 Delete the words "unusual delay in deliveries, unavoidable casualties".

8.3.1 Paragraph 8.3.1 of the GENERAL CONDITIONS is amended with addition of the following paragraphs:

8.3.1.1 Extension of time for completion of the work on account of rainfall, snow, or cold weather during the contract time will be subject to approval by the Architect and as provided in Section 01 29 76. Request for extension of time is to be submitted with each Request for Payment. Request for extension of time is to be submitted in writing within Thirty (30) days of the occurrence. If Contractor fails to submit request, time extension will not be approved for the pay period.

8.3.1.2 If it is not possible to obtain certain materials when needed and the Contractor submits evidence that he issued purchase orders and/or subcontracts immediately following execution of the Contract with the Owner and that he and his subcontractors have made every reasonable effort to obtain the materials when or

before needed, delays in completion due to inability to obtain such materials will be acknowledged as being "beyond the Contractor's control".

8.3.2 Add the following paragraphs:
Any claim for extension of time shall be made in writing to the Owner/Architect not more than Seven (7) days after commencement of the delay, otherwise, it shall be waived. In case of a continuing delay only one claim is necessary. In case of claims for extensions of time because of adverse weather, such extensions of time shall be granted only when such adverse weather prevented the execution of major items of Work as defined in paragraph 8.3.2.4 on normal working days and exceeds the number of anticipated days. The following are considered reasonable anticipated days of adverse weather on a monthly basis and shall be included in the contract time.

January	11 days	July	6 days
February	10 days	August	6 days
March	8 days	September	4 days
April	7 days	October	5 days
May	5 days	November	7 days
June	6 days	December	8 days

8.3.2.3 Adverse weather days, beyond each of the monthly totals will be allowed to extend contract time, without additional cost, only if approved and authorized by the Architect, and the Owner.

8.3.2.4 An adverse weather day is defined as a day where at least four (4) hours of work on a principal unit of work (critical path) underway, between the hours of 7:00 AM and 6:00 PM cannot be completed because of weather conditions beyond control of the contractor.

8.3.2.5 Extension of time will be subjected to approval by the Owner/Architect and as provided in Section 01 29 76 .

ARTICLE 9. PAYMENTS AND COMPLETION

9.3.1 Paragraph 9.3.1 of the General Conditions is deleted. Add the following:

9.3.1 On or before the date established for submittal of each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations prepared in accordance with the schedule of values. Such application shall be notarized and supported by data supporting the Contractors' right to payment such as copies of requisitions from Subcontractors and materials suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents. Refer to Section 01 29 76 for additional provisions.

9.3.1.1 Paragraph 9.3.1.1 of the General Conditions is deleted.

Add the following Subparagraph:

9.3.1.1 In making partial payments for the work, there shall be retained **Five (5%) percent** of the estimated amount for labor and materials until final completion and acceptance of all work covered in the contract. Retainage shall be paid to the Contractor in the final payment if all conditions of the contract documents have been met.

9.3.2 Paragraph 9.3.2 is modified with the following addition:

9.3.2.1 PAYMENT APPLICATIONS FOR MATERIALS STORED OFF SITE. Payments will only be processed for materials stored off site that are stored in a bonded warehouse. Payment claims for materials stored off site must be accompanied with an itemized list of materials establishing value, proof that the materials are insured, and a receipt of storage from a bonded warehouse. Upon payment of materials stored, title to the material shall be to the Owner. All expenses incurred in storage of materials will be paid by the Contractor.

9.6 Section 9.6 is amended with the following addition:

9.6.9 LIQUIDATED DAMAGES. If the Contractor fails to complete the work within the time agreed in this contract, or any agreed extension thereof, he shall pay to the Owner as liquidated damages, fixed or agreed, and not as a penalty, the sum as stipulated on Proposal Form for each calendar day of delay of the work, which sum shall be withheld by the Owner from payments due to be made to the Contractor by the Owner under the terms of the contract.

Delete Paragraph 9.8.1 and replace with the following:

9.8.1 The date of substantial completion of the work or designated portion thereof is the date certified by the Architect when construction is sufficiently complete in accordance with the Contract Documents, so the Owner can occupy or utilize the work or designated portion thereof for the use for which it is intended without sacrificing the quality of services or having to significantly modify operations from intended usage as per design, as expressed in the Contract Documents.

Delete Paragraphs 9.8.2 through 9.8.5 and replace with the following paragraphs:

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. The contractor shall notify Architect ten (10) days prior to the date on which the building will be ready for final inspection. The Contractor shall proceed promptly to complete and correct items on his list. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Document and ready for Architect/Engineer's final punch. Provide submittals to Architect / Engineer that are required by any governing body or other authorities. Upon receipt of the Contractor’s list, the Architect will

perform a punch and determine by observation whether the Work or designated portion thereof is substantially complete. Failure to include an item on the final list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Significant amounts of incomplete work found during the inspection shall be grounds for ceasing the inspection. Minor adjustments and corrections to work shall not be considered cause for discontinuing final inspection. When the Architect determines that Work or designated portion thereof is substantially complete, he will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, insurance, subsequent damage to the Work. Should all work not be completed at the time substantial completion is set, the Certificate of Substantial Completion 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. 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.

9.8.3 Upon Substantial Completion of the Work or designated portion thereof, receipt of closeout documents called for in Section 01 77 00 and upon final application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents. The final application for payment will not be approved for payment by the Architect until the "CLOSEOUT" documents are provided to and reviewed by the Architect by the Contractor. These documents are to be complete in every respect with no exclusions or exceptions. Closeout documents shall be delivered to the Architect no later than thirty (30) calendar days from Date of Substantial completion.

ARTICLE 11 INSURANCE AND BONDS

Add the following paragraph:

11.6 Refer to AIA Document A101 - 2017 Exhibit A for additional Insurance and Bond requirements.

ARTICLE 13 MISCELLANEOUS PROVISIONS.

13.1 Section 11.3 is amended as follows:
The contract shall be governed by the law of the place where the project is located, excluding jurisdiction's choice of law.

13.4.1 Modify the last sentence as follows:
The Contractor shall directly arrange for and the owner pay for tests, inspections, or approvals where building codes or applicable laws of regulations so require unless otherwise provided for in individual specification sections or on drawings.

Second sentence - Change the beginning of the statement "Unless otherwise provided" to read: "Unless otherwise provided for in individual specification sections or on drawings,"

13.4.4. The words "and Owner" shall be added to Subparagraph 13.5.4. The Owner shall have all of the rights which the Architect would have had under these changed Articles and Subparagraphs.

ARTICLE 15. CLAIMS AND DISPUTES

Modify the following paragraphs:

15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by date accompanying each payment request, 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 beyond anticipated weather days as stated in 8.3.2 of General Conditions.

15.3.2 Delete the last sentence of this paragraph.

Add the following sentence:

15.3.4 If mediation proves unsuccessful the dispute will be handled in Benton County, AR, Court of Law.

15.4 ARBITRATION. All references to arbitration will be deleted from contract document AIA 201 General Conditions of the Contract for Construction, and specifically paragraphs 15.4.1; 15.4.1.1; 15.4.2; 15.4.3; 15.4.4; 15.4.4.1; 15.4.4.2; 15.4.4.3.

END OF SECTION

SECTION 01 00 00

GENERAL REQUIREMENTS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General intention.

B. General Method of Procedure.

C. Applicable State and Local Law

D. Fire Protection Verification

E. Restoration.

F. Erosion Control.

1.2 GENERAL INTENTION

A. Contractor shall completely prepare site for building operations, including demolition of existing items where noted, furnish labor and materials, and perform work for A Remodel & Addition for Benton County Detention Center, Bentonville, AR, as required by drawings and specifications.

B. Visits to the site by Bidders may be made only by appointment.

C. In some instances, it may have been impracticable to detail all items in specifications or on drawings because of variances in manufacturer's methods or of multiple methods of achieving specified results. In such instances Contractor will be required to furnish all labor, materials, drawings, services and connections necessary to produce systems or equipment which are completely installed, functional, and ready for operation by personnel in accordance with their use. Contractor and each subcontractor is to perform work to comply with standard practices of his or her trade or profession.

D. Offices of HIGHT/JACKSON/ASSOCIATES/P.A., as Architects, will render certain technical services during construction. Such services shall be considered as advisory to the Owner and shall not be construed as expressing or implying a contractual act of the Owner without affirmations by the Owner or his duly authorized representative.

1.3 GENERAL METHOD OF PROCEDURE

A. Working space and space available for storing materials shall be verified with the Owner prior to construction.

B. Workmen are subject to rules of the Owner applicable to their conduct.

C. Execute work to interfere as little as possible with normal functioning of Owner as a whole, including operations of utility services, fire protection systems and any existing equipment. Use of equipment and tools that transmit vibrations and noises through the building structure are to be limited to the times coordinated with the Owner. Do not store materials and equipment in other than assigned areas.

D. Contractor shall furnish Architect with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof.

E. If work is scheduled to be performed on Saturdays, Sundays or holidays the Contractor shall provide written notification to the Architect indicating dates on which work will be performed. Notification shall be a minimum of 48 hours before the work date commences.

F. Building will be occupied during performance of work, but areas of alterations will be vacated as required. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in Owner operations will not be hindered. Contractor shall permit access to Owner personnel through construction areas. Contractor to provide temporary means of protected access to all occupied areas of alteration during the construction period.

G. When an area of the building is turned over to Contractor, Contractor shall accept entire responsibility thereof.

H. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment Contractor shall make arrangements for pre-inspection of site with Fire Department.

I. Existing Utilities: Before construction can begin, contractor shall have all existing underground utility line locations in affected construction area verified and located by one-call service, if this service exists. In addition consult Owner and/or utility companies. In Arkansas the one-call phone number is 1 800-482-8998. Contractor is to provide written proof that contact with utility companies and any private utilities such as telephone companies that the Owner may have contracted with. Provide a statement that contact has been made with Owner's personnel, all utility companies, and that all utility lines have been located to the best of their knowledge and ability. It shall be the responsibility of the contractor to relocate all existing utilities which conflict with the proposed improvements shown on the drawings.

J. Utilities Services: Maintain existing utility services for building at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer, air pipes, or conduits, wires, cables, etc., of utility services or of fire protection systems and

communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Architect/Engineer.

1. All such work required in connection with telephone systems shall be done by Owner's Telephone Company at Contractor's expense.
2. No utilities service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Owner.
3. Contractor shall submit a request to interrupt any such services to Owner 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.

K. Abandoned Lines: Any service line and items such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceiling, within furred spaces, in unfinished areas, or within walls or partitions, so that they are completely behind the finished surfaces.

L. To minimize interference of construction activities with flow of traffic comply with the following:
   1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.

M. Protection: Provide following protective measures:
   1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
   2. Temporary protection against damage to all portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
   3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.
   4. Dampen debris to keep down dust and provide temporary dust proof barrier partitions in existing structures where necessary. Equip barrier partitions with hinged doors for access. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.

N. Staging and construction traffic
   1. Refer to civil drawings for staging area and routing of construction traffic.

1.4 APPLICABLE STATE LAWS

A. Contractor and all subcontractors of all trades present on site shall comply with state and local laws and ordinances while present on public property.

B. **Absolutely no tobacco or e-cigarette use is permitted in building or on the project site.**

1.5 FIRE PROTECTION VERIFICATION

A. Contractor to be responsible for verifying existing fire alarm and fire sprinkler system and coordinating with new addition or remodel as required by current state and local building code requirements.

B. If any changes to the contract during construction occurs that involves work to any addition, or remodel, of this project, or work in an adjacent building, Contractor to be responsible for verifying and adding onto, altering or updating existing fire alarm or fire sprinkler system to meet state and local current code requirements and verified by representative of the local fire department having jurisdiction.

1.6 RESTORATION

A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of Architect/Engineer. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Architect before it is disturbed. Materials and workmanship used in restoring work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

B. Upon completion of contract, deliver work complete and undamaged. Damage caused by Contractor or Contractor's workmen to existing structures, grounds, and utilities or work done by others shall be repaired by Contractor and left in as good condition as existed prior to damaging.
   1. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (except telephone) which are indicated on drawings, and which are not scheduled for discontinuance or abandonment.
   2. Restoration work required for damage to telephone systems shall be done by Owner's Telephone Company at the Contractor's expense.

C. Consequential damage to Owner's existing equipment or building contents in the existing building or on site because of work being performed will be replaced at Contractor's expense.

D. Consequential damage to existing building or site components as a result of work being performed will be repaired or replaced at Contractor's expense.

1.7 EROSION CONTROL

A. The site work contractor is to comply with the provisions of the Arkansas Water and Air Pollution Control Act (Act 274 of 1949, as amended, AR Ann. 8-4-101 et seq.), and the Federal Clean Water Act 33 U.S.C. 1251 et seq. which safeguards the storm water runoff to all receiving waters, i.e., streams, lakes and oceans by limiting effluent, erosion and other conditions. Application for permitting and monitoring requirements will be required through the state where the work is being performed. State of Arkansas, Storm Water Section NPDES, PO Box 8913, Little Rock, AR 72214 Phone 501/-682-0628.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract Description.

B. Description of the work.

C. Owner supplied Products.

D. Contractor use of site and premises.

E. Future work.

F. Work sequence.

G. Site security and encumbrances.

H. Owner occupancy.

I. Permits and fees

1.2 CONTRACT DESCRIPTION

A. Contract Type: Stipulated Price, AIA document A101-2017.

1.3 DESCRIPTION OF THE WORK

A. The work under this contract will include all work as shown on drawings and specifications and shall include all work required to complete the project **with exception of the following:**
   1. Millwork is to be provided and installed by the Owner. The Contractor is to coordinate with the plumbing and electrical.

B. Items noted NIC (Not in Contract), will be supplied and installed by Owner.

C. Contractor is responsible for familiarizing himself with the entire project; for expediting and completing all phases of the project in accordance with the Contract Documents; and is solely responsible for work completed by other trades under his contract.

D. Contractor is responsible for coordinating items furnished and installed by owner.

1.4 OWNER SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
   2. Arrange and pay for Product delivery to site.
   3. On delivery, inspect Products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed Shop Drawings, Product Data, and Samples. Verify owner supplied products fit where product is to be installed or placed.
   2. Receive and unload Products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish Products.
   4. Repair or replace items damaged after receipt.

C. Products supplied to site and installed by Owner’s direct hire installer/contractor:
   1. Millwork
   2. Access Control System (all specified parts in 08 71 00 to be provided and installed by contractor)
   3. Residential Appliances
   4. Furniture
   5. Property Storage Conveyor System

1.5 CONTRACTOR USE OF SITE AND PREMISES

A. Limit use of site and premises to allow construction and remodeling in accordance with contract and construction documents.

1.6 WORK SEQUENCE

A. Construct Work in phases, to accommodate Owner's occupancy requirements. Coordinate construction schedule and operations with Owner and Architect.

B. Properly prepare all work to receive subsequent work or finish. Notify Architect if any work is unsatisfactory to receive such subsequent work or finish and receive his instructions before proceeding. Failure to make such notification by trade applying work over unsatisfactory materials will constitute his acceptance or responsibility for making the necessary corrections.

C. Contractor to take photographs of Critical areas of work and other items as deemed necessary when asked to do so by Architect/Engineer. Refer to Section 01 32 33.

1.7 SITE SECURITY

A. Contractor is responsible for securing the site at all times to prevent loss of property or injury to persons present at site. Such responsibility shall remain with the Contractor until all work is completed.

B. Refer to Section 01 50 00 for temporary construction fencing requirements.

1.8 SITE ENCUMBRANCES

A. Contractor will remove and/or relocate all interfering concrete slabs, driveways, curbs, walks, trees, footings, etc., prior to construction.

B. Contractor shall maintain utilities in operation on temporary basis till near the end of construction when finished utilities shall be completed.

C. Contractor will cut grass and weeds before starting of project and dispose of same.

1.9 ACCESS TO PROPERTY

A. All personnel entering the site must submit the Application for Access form attached to the end of this specification section and will undergo a background check. No felons will be allowed to access any secure areas of the building or site.

B. Please note the following:
   1. No personnel onsite until they have cleared the background check.
   2. Commercial vehicles ONLY within the secured area of the site. Personal vehicles will be required to park outside the gates in areas designated by the owner.
   3. All vehicles on County Property are subject to search at any time.
   4. Daily bag checks will be required.
   5. A deputy will be onsite at all times during construction. Contractor will be required to coordinate working hours with the owner.

C. Access for workmen and delivery of materials and equipment to immediate construction working areas within building is to be coordinated with the Owner. Provide unobstructed access to building areas required to remain in operation. Use hoist or lift wherever practical to move equipment and materials to levels above the ground floor. Hoist or lift is to be removed from premises at completion of construction.

D. Access by Contractor and his personnel through occupied portions of buildings is not permitted within the occupied building area except along designated routes verified by the Owner.

1.10 OWNER OCCUPANCY

A. Building will be occupied during performance of work, but areas of alterations will be vacated as required. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in Owner operations will not be hindered. Contractor shall permit access to Owner personnel through construction areas. Contractor to provide temporary means of protected access to all occupied areas of alteration during the construction period.

1.11 PERMITS AND FEES

A. Contractor to be responsible for verifying and obtaining written list of all permits, fees, etc. from local, county, state, and federal (if applicable) governing bodies that will apply to this project. Contractor is responsible for paying for these permits and fees.

B. Building Permit - Contractor secure and pay for city building permit if required by City.

C. Special Permits/Fees – Contractor and/or subcontractors shall be responsible for securing and paying for all special permits, licenses and fees that may be required by local, state, or federal laws as may be applicable to the review, installation or certification of their systems and materials or required for installation of such materials.

D. Connection Fees - Contractor and/or subcontractors shall be responsible for securing and paying for all fees and associated costs for review of, and connection to public utility services.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

BENTON COUNTY SHERIFF'S OFFICE DETENTION CENTER

APPLICATION FOR FOR ACCESS

COMPANY WORKING FOR			COMPANY CONTACT INFO	
APPLICANT NAME (PRINT)			EMAIL ADDRESS	
ADDRESS				DATE OF BIRTH
CITY		STATE / ZIP CODE		GENDER ◯ MALE ◯ FEMALE
TELEPHONE NUMBER	LAST 4 DIGITS OF SSN	DRIVER'S LICENSE STAET & NUMBER		
VEHICAL TO BE USED ON SITE: LICENSES PLATE NUMBER & STATE, MAKE, MODEL & COLOR				

1. In visiting the Benton County Detention Center, I may be in circumstances involving risks or hazards. I willingly and knowingly accept these conditions.

2. I agree to:

   a. Take nothing, including letters, in or out of any correctional center without approval from administration.
   b. Respect the confidentiality of records and other privileged information.
   c. Refrain from using abusive or profane language.
   d. Refrain from taking photographs on institutional property for any purpose without specific permission from the administration.
   e. Refrain from giving/leaving anything behind for use by an offender without approval from administration.
   f. Refrain from inappropriate signs of affection.
   g. Obey any staff member order.
   h. Refrain from racially inflammatory speech, disparaging other religions or directly addressing issues of confinement.

3. All vehicles will have doors locked, windows up and key removed from ignition.

4. No drugs are allowed in the institution except a personal one-day supply of prescribed medication in the original prescription container.

5. No tobacco products or electronic cigarettes (e-cigarettes) are allowed in all department facilities (except for authorized religious purposes or in designated smoking areas) and in all state owned or leased vehicles in accordance with the non-smoking and tobacco free department procedure.

6. If applicable, I will complete all training as required by the department.

7. I understand I cannot enter the facility until the site coordinator has received this application, it has been approved, and my name has been added to the Approved Entry Roster.

8. Failure to abide by this agreement or violation of any state or federal law during my visit may result in sanctions including arrest and prosecution.

9. I understand that vehicles and property are subject to search by any member of BCSO staff.

I authorize Benton County Sheriff's Office to conduct a Criminal History Check Screening.

Signature:_____ **Date:** _____

SECTION 01 21 13

CASH ALLOWANCES

PART 1 GENERAL

1.1 SCOPE

A. The following allowances are stated for the purpose of stabilizing each bid and for establishing an amount of credit to purchase the identified items. Each price stated shall include F.O.B. Job site delivery, tax included unless noted otherwise, but shall not include Contractor markup and installation as they are to be included in the bid and/or Contract. Cash Allowances Are to be included as part of the bid price.

1.2 ALLOWANCE CREDIT

A. Any unused allowance money will be returned to the owner. Unused materials shall be returned for credit, which will be given to the owner, after installation has been completed and accepted. When it is not economically practical to return material for credit, prepare and deliver all unusable material for storage by Owner. It will be the contractor's responsibility to dispose of unused material that the owner has indicated he does not want.

1.3 ITEMS

A. Unforeseen Conditions
   1. Provide an allowance of **FIFTEEN THOUSAND DOLLARS ($15,000.00)** for unforeseen conditions. Allowance is to be used by Owner. Allowance is to be tracked as a line item on the pay application. Any unused funds are to be returned to the Owner per final Change Order.

END OF SECTION

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Measurement and payment criteria applicable to portions of the Work performed under a unit price payment method.

B. Defect assessment and nonpayment for rejected work.

1.2 AUTHORITY

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. The Architect/Engineer will verify measurements and quantities.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED

A. All labor and material shall be provided as shown in construction documents, unless otherwise noted. Pricing for unit quantities referenced in the individual specification sections are for bidding and in cases of unusual conditions of change in scope of work.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted. Quantities and measurements supplied or placed into the work shall be verified by a third party and approved by the Architect/Engineer prior to proceeding with work. The cost for work performed by the third party to verify quantities shall be paid for by Contractor, unless noted otherwise.

C. Each Unit Price shall include all costs incurred to the contractor for the particular item the Unit Price provides for.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.

3. Metering Devices: Inspected, tested and certified by the applicable State department within the past year.

B. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

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

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

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

F. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.5 PAYMENT

A. Payment Includes: Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Architect/Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

1.6 DEFECT ASSESSMENT

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

B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct one of the following remedies:
   1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Architect/Engineer.
   2. The defective Work will be partially repaired to the instructions of the Architect/Engineer, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Architect/Engineer.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of the Architect/Engineer to assess the defect and identify payment adjustment is final.

1.7 NONPAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.8 SCHEDULE OF UNIT PRICES

A. Item: Rock Removal, Section 31 23 16.

B. Item: Engineered Fill, Section 31 23 00.

C. Item: Earth Removal, Section 31 23 00.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 26 00

MODIFICATION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Documentation of change in Contract Sum/Price and Contract Time.

C. Change procedures.

D. Construction Change Directive.

E. Stipulated Sum change order.

F. Unit price change order.

G. Time and material change order.

H. Execution of change orders.

I. Correlation of Contractor submittals.

1.2 RELATED SECTIONS

A. Document 00 72 00 - General Conditions - AIA: Governing requirements for changes in the Work, in Contract Sum/Price, and Contract Time.

B. Document 00 73 00 - Supplementary General Conditions - AIA: Percentage allowances for Contractor's overhead and profit.

C. Section 01 33 00 - Submittals: Schedule of values.

D. Section 01 60 00 - Material and Equipment: Product options and substitutions.

E. Section 01 77 00 - Contract Closeout: Project record documents.

1.3 SUBMITTALS

A. Submit the name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Change Order Forms: AIA G701. Change Order.

1.4 DOCUMENTATION OF CHANGE IN CONTRACT SUM/PRICE AND CONTRACT TIME

A. Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.

B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

C. Provide additional data to support computations:
   1. Quantities of products, labor, and equipment.
   2. Taxes, insurance, and bonds.
   3. Overhead and profit.
   4. Justification for any change in Contract Time.
   5. Credit for deletions from Contract, similarly documented.

D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:
   1. Origin and date of claim.
   2. Dates and times work was performed, and by whom.
   3. Time records and wage rates paid.
   4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.5 CHANGE PROCEDURES

A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by AIA A201, 2017 Edition, Paragraph 7.4 by issuing a Field Order, AIA Form G708, Supplemental Instructions, AIA Form G710 or Hight Jackson Associates Architect's Supplemental Instructions.

B. The Architect/Engineer may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and change in Contract Time for executing the change with a stipulation of any overtime work required. Contractor will prepare and submit an estimate within 10 calendar days unless instructed otherwise.

C. The Contractor may propose a change by submitting a request for change to the Architect/Engineer, 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/Price and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Architect/Engineer may issue a document, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

B. The document will describe changes in the Work and will designate method of determining any change in Contract Sum/Price or Contract Time.

C. Promptly execute the change in Work.

1.7 STIPULATED SUM CHANGE ORDER

A. Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

1.8 UNIT PRICE CHANGE ORDER

A. For predetermined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.

B. For unit costs or quantities of units of work which are not predetermined, execute Work under a Construction Change Directive.

C. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

1.9 TIME AND MATERIAL CHANGE ORDER

A. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

B. Architect/Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

C. Maintain detailed records of work done on a Time and Material basis.

D. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

1.10 EXECUTION OF CHANGE ORDERS

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

1.11 CORRELATION OF CONTRACTOR SUBMITTALS

A. 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/Price.

B. 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.

C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 29 76

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for payment.

1.2 RELATED SECTIONS

A. Document 00 72 00 - General Conditions - AIA: Progress payments and final payments.

B. Section 00 73 00 - Supplementary General Conditions

C. Section 01 31 00 - Coordination and meetings:

D. Section 01 32 36 – Construction Progress Schedules: Submittal procedures.

E. Section 01 77 00 - Contract Closeout: Final payment.

1.3 FORMAT

A. AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet.

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

1.4 PREPARATION OF APPLICATIONS

A. Present required information in typewritten form or on electronic media printout.

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 an extension on AIA G703 - Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.

E. Prepare Application for Final Payment as specified in Section 01 77 00.

1.5 SUBMITTAL PROCEDURES

A. Submit three copies of each Application for Payment.

B. Submit three copies of **updated** construction schedules with each Application for Payment.

C. Submit three copies of Certificate of Insurance for items stored off-site with each Application for Payment.

D. Submit delays caused as a result of adverse weather, strikes, etc. Include backup with each pay application. Provide project superintendent's weather log for project with each pay application. If no delay days occurred during the last pay period provide statement on transmittal or letter stating that no delay days occurred. Delay days for Saturday and Sunday and Holidays will not be approved unless prior notice has been given and accepted by Architect. Approved delay days will not result in an increase in completion time unless days exceed anticipated delay days as set forth under Supplementary General Conditions.
   1. Submit as part of the pay application a monthly updated CPM work schedule as required in Section 01 32 36.
   2. Monthly Progress Report
      a. Refer to Section 01 31 00, paragraph 1.7 for details.
   3. Updated and currently in force proof of insurance. (The proof of insurance needs to only be filed during the month of renewal, however, a lapsed Insurance Certificate will result in Pay Application being held as incomplete)
   4. Failure to submit any of the above required items will result in pay application being held until submissions are complete.

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

F. Submit with transmittal letter as specified for Submittals in Section 01 33 00.

1.6 SUBSTANTIATING DATA

A. When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question.

B. Provide one copy of data with a cover letter for each copy of submittal. Show application number and date, and line item by number and description.

C. Include the following with the application when substantiating data is asked for:
   1. Current available construction photographs of item in question.
   2. Record documents for review by the Owner which will be returned to the contractor.
   3. Affidavits attesting to off-site stored products.
   4. Construction progress schedules revised and current.
   5. Other data and information as required or asked for by Architect.

D. Partial Lien Waivers: If directed by Owner or Architect, the Contractor may be required to submit partial lien waivers of subcontractors and suppliers accompanying payment request applications to show proof that he has made percentage of progress payment as shown on previous payment request application. If partial lien waivers are asked for, Contractor must submit them for review and approval. If he has not submitted them, or if a subcontractor or supplier has not been paid for the previous pay periods, the current pay application will not be processed until partial lien waivers are received and approved, or until justification is accepted by Owner and Architect as to the reason payment was withheld for the subcontractor or supplier on previous payment applications.

1.7 PROOF OF INSURANCE FOR MATERIALS STORED OFF SITE.

A. Payments will only be processed for materials stored off site that are stored in a bonded or insured warehouse. If materials are stored off site on a secure open-air site, material must be insured. Payment claims for materials stored off site must be accompanied with an itemized list of materials establishing value, proof that the materials are insured, and a receipt of storage from a bonded warehouse. Upon payment of materials stored, title to the material shall be to the Owner. All expenses incurred in storage of materials will be paid by the contractor.

1.8 RETAINAGE

A. In making partial payments for the work, there shall be retained **Five (5%) percent** of the estimated amount for labor and materials until final completion and acceptance of all work covered in the contract. Retainage shall be paid to the Contractor in the final payment if all conditions of the contract documents have been met including completed close-out documents and as-built drawings

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 31 00

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Pre-construction meeting.

C. Field engineering

D. Progress meetings.

E. Pre-installation meetings.

F. Equipment electrical characteristics and components.

G. Examination.

H. Preparation.

I. Schedule and Reports

1.2 COORDINATION AND PROJECT CONDITIONS

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

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

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

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

E. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work if designated for Owner's partial occupancy.

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

1.3 FIELD ENGINEERING

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

B. Control datum for survey is shown on Drawings.

C. Verify setbacks and easements; confirm drawing dimensions and elevations.

D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.4 PRECONSTRUCTION MEETING

A. Owner, through Architect/Engineer will schedule a meeting after Notice of Award.

B. The Contractor shall conduct meeting.

C. Attendance Required: Owner, Architect/Engineer, Prime Contractor, Major Subcontractors, Representatives of Governmental or other regulating Agencies.

D. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
4. Submission of list of Subcontractors, schedule of values, and progress schedule.
5. Designation of personnel representing the parties in Contract, and the Architect/Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, and Change Order procedures.
7. Scheduling and coordination of prime contractors.
8. Inspection procedures.
9. Shop drawings and Submittals, Grouping of Submittals
10. Critical areas of the work
11. Reports, testing and scheduling activities of a Geotechnical Engineer.
12. Use of premises by Owner and Contractor.
13. Owner's requirements and occupancy.
14. Construction facilities and controls.
15. Temporary utilities.
16. Procedures for maintaining record documents (As-Builts).
17. Requirements for start-up of equipment.

18. Inspection and acceptance of equipment put into service during construction period.
19. Contract closeout procedures, Substantial Completion, Final inspection, warranties, and manuals.
20. Other items as deemed necessary by the Architect or owner.

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

1.5 PROGRESS MEETINGS

A. Contractor will schedule and administer meetings with assistance of Architect throughout progress of the Work at biweekly intervals unless different interval is approved by Architect.

B. Contractor will schedule and make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Schedule comments from Architect on agenda. Architect to approve schedule.

C. Contractor shall provide written copies of previous items of discussion, resolution of same, and any new outstanding issues to be addressed.

D. Attendance is required by the following people:
1. General Contractor's Project Manager and Job Superintendent
2. Project Manager and Field Foreman for each trade currently working on the site.
3. Project Manager of any trade who will be mobilizing on site during the next thirty (30) days.
4. Representative of Major Suppliers
5. Owner/Architect/Engineer as appropriate to address agenda items.

E. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Contractor to present outline work schedule for the next month.
14. Other business relating to Work.

F. Contractor to record minutes and distribute copies within two days after meeting to participants, with copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect/Engineer four days in advance of meeting date.

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

E. Attendance Required: Contractor's Project Manager, Job superintendent, major Subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

1.7 PROGRESS REPORTS

A. The Contractor shall submit monthly progress reports to the Architect, attached to his request for payment, showing each major item of the work, the current percentage of completion, and whether ahead or behind schedule. Any delays beyond the contractor's control, such as adverse weather conditions, strikes, etc., that delay the project completion are to be documented and submitted each month along with the progress report. Orders for all materials, except those requiring a decision by the Owner, must be placed within thirty (30) days after award of the contract and evidence of such orders furnished to the Architect. For order of materials requiring Owner decision, such as color, texture, etc; these orders will be placed as soon as possible after selection. Contractor is responsible for notifying the Architect when delaying selection will cause delays in completion. <u>These requirements will be considered mandatory prior to any approval of monthly pay request by the Architect.</u>

B. Include the following items as additional requirements of the monthly report.
   1. Updated schedule
   2. All meeting minutes for month
   3. Updated submittal schedule
   4. RFI log (all logs should contain date submitted to Architect, Date returned and Status)

1.8 OWNER'S ACCESS TO CONSTRUCTION

A. In addition to the Architect, the Owner shall be allowed to provide on-site representation as he deems necessary. Contractor and all subcontractors are to allow access to this (these) Individual(s) identified during the pre-construction conference, or by later correspondence from the Architect.

Note: The Architect shall remain the sole responsible party for making selections, determining colors and/or textures, and directing changes in the scope or corrections to the work covered by this contract. **NO EXCEPTIONS!**

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS & DOCUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Photography.

B. Electronic Photographic Digital Images

C. Technique.

D. Submittals.

1.2 RELATED SECTIONS

A. Section 01 11 00 - Summary of Work: Stages of the Work.

B. Section 01 77 00 - Contract Closeout: Project record documents.

1.3 PHOTOGRAPHY

A. Have available a digital camera of sufficient quality to produce photographs of site and construction throughout progress of work when required or asked for by Architect or Owner. Contractor must have means of electronically transferring images from job site and office via e-mail to Architect/Engineer.

B. If an Architect elects to view an observation such as footing or slab preparation via photos taken by Contractor, placement will not take place until Architect/Engineer reviews and issues observation and comment of photos.

C. Take photographs of critical areas asked of the Architect/Engineer.
Such areas might be:
1. Excavations.
2. Foundations.
3. Structural framing.
4. Enclosure of building.
5. Other items as asked for.

1.4 IMAGES

A. Full color.

B. Size: Appropriate to show detail required.

C. Identify each image in electronic file name. Identify name of Project, and date of view.

D. Deliver electronic images to Architect immediately for his/her review and retention in job files.

1.5 VIEWS

A. Consult with Architect/Engineer for instructions on views required.

1.6 SUBMITTALS

A. Deliver e-mail images for each requested installation.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 32 36

CONSTRUCTION PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Format.

B. Content.

C. Revisions to schedules.

D. Submittals.

1.2 RELATED SECTIONS

A. Section 01 11 00 - Summary of Work: Work sequence.

B. Section 01 29 76 - Applications for Payment: Application for payment.

C. Section 01 33 00 - Submittals: Shop drawings, product data,

1.3 FORMAT

A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week.

B. Scale and Spacing: To provide space for notations and revisions.

C. Sheet Size: Multiples of 11 x 17 inches.

1.4 CONTENT

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

B. Identify each item by specification section number.

C. Identify work of separate stages, and other logically grouped activities.

D. Show critical path for sequencing of trades and materials.

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

F. Coordinate content with schedule of values specified in Section 01 29 76.

1.5 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes. Show on schedule by either variation of shading or patterns so the difference is apparent.

C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule and report corrective action taken or proposed and its effect.

D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including dates when submittals will be required from Architect. Show decision dates for selection of finishes.

1.6 SUBMITTALS

A. Submit initial schedules on or before pre-construction conference. After review, resubmit required revised data within ten (10) days.

B. Submit revised Progress Schedules with each Application for Payment. Pay request will not be processed without revised schedule submittal. Submit one copy for each copy of the Application for payment.

C. Submit a computer generated horizontal bar chart with separate lines for each section of Work, identifying first work day of each week.

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

E. Indicate estimated percentage of completion for each item of Work at each submission.

F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

G. Show critical path if sequence of work is dependant on certain items or trades completing their work in order for the project to be completed on time.

1.7 DISTRIBUTION

A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.

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

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Proposed Products list.

C. Product Data.

D. Shop Drawings.

E. Samples.

F. Design data.

G. Test reports.

H. Certificates.

I. Manufacturer's instructions.

J. Manufacturer's field reports.

K. Warranties

L. Erection drawings.

1.2 RELATED SECTIONS

A. Section 01 40 00 - Quality Control: Manufacturers' field services and reports.

B. Section 01 77 00 - Contract Closeout: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

1.3 REFERENCES

A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.4 GENERAL SUBMITTAL PROCEDURES

A. Transmit each submittal with AIA Form G810. Or Architect/Engineer accepted form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply Contractor's stamp signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. **Contractor shall review submittal before submitting to Architect.** Architect will not review submittal until Contractor has shown proof of review.

E. **Group submittals of like type together such as Plumbing submittals, HVAC submittals, Masonry submittals, Structural submittals, etc.** Review of single submittals of like types will be subject to delay until remaining submittals related to that being submitted are received by Architect.

F. Architect will review submittals and if applicable, forward to consultant(s) for review. Upon review, Architect or consultant shall stamp each set of submittals indicated review status or required action, if any. This stamp in no way relieves the Contractor of meeting the requirements and/or intent of the specifications. Architect's review of shop drawings and submittals is for intent and general compliance with contract documents. All other criteria are the sole responsibility of the General Contractor and his supplier.

G. Schedule submittals to expedite the Project and deliver to Architect/Engineer at business address. Coordinate submission of related items.

H. Where colors and/or patterns are to be selected, or specifications include cash allowances by Architect, request such selections and materials in ample time for procurement.

I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor. However, Architect will make every effort to return submittals in a timely manner.

J. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

K. Provide space for Contractor and Architect/Engineer review stamps on front of submittal, minimum space of 4" x 8" on right hand border.

L. When revised for resubmission, identify all changes made since previous submission. Similar procedure is to be followed when resubmitting.

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

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

1.5 ELECTRONIC SUBMITTAL PROCEDURE

A. **All product data sheets, shop drawings, and miscellaneous submittal information are to be submitted electronically via email, FTP site, or other acceptable electronic submittal means. Please note that at Architect's discretion for large shop drawing submittals, a hard copy would need to be submitted along with electronic submittal. Architect will advise contractor of such submittals.**
   1. Contractor shall perform initial review and have comments and review stamp included on electronic submittal or shop drawings. **Please note that this is mandatory. Submittals and shop drawings will not be reviewed by Architect until Contractor reviews them and notes any comments or corrections required.**
   2. Submit for Architect's review.
   3. After review, electronic copy will be sent back to Contractor with any comments and markups, including review stamp status. If comments require re-submittal of all or partial original submittals or shop drawings, correct and resend for final approval or for Architect's record copy.
   4. Contractor to list specification section related to each item submitted. This shall include product data and shop drawings.

B. Items to be included in electronic submittals (As required by each product or item specification section):
   1. Product data
   2. Shop drawings
   3. Design data
   4. Test reports
   5. Certificates
   6. Manufacturer's instructions
   7. Warranties
   8. Erection drawings
   9. Any other information pertinent to a product or item.

1.6 PRODUCT DATA

A. Product Data for Review:
   1. Submitted to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 - CONTRACT CLOSEOUT.

B. Product Data for Information:
   1. Submitted electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Product Data for Project Closeout:
   1. Submitted for the Owner's benefit during and after project completion.

D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

E. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

F. After review distribute in accordance with the Submittal Procedures article above and provide copies of record documents described in Section 01 77 00 - CONTRACT CLOSEOUT.

1.7 SHOP DRAWINGS

A. Shop Drawings for Review:
   1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 - CONTRACT CLOSEOUT.

B. Shop Drawings for Information:
   1. Submitted electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings for Project Closeout:
   1. Submitted for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.8 SAMPLES

A. Samples for Review:
   1. Submit actual samples to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

B. Samples for Information:
   1. Submit actual samples for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Samples for Selection:
   1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.
   2. Submit samples of finishes from the full range of manufacturers' current standard colors, textures, and patterns for Architect/Engineer selection.

3. After review, produce duplicates and distribute them in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 77 00 - CONTRACT CLOSEOUT.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Submit the number of samples specified in individual specification sections; one of which will be retained by Architect/Engineer.

G. For each job-finished material (i.e. Masonry, Stucco, concrete, paint and other finishes), prepare a sample panel as called for in individual sections. Obtain Architect's approval before installing balance of such work. Architect may require additional panels or samples. Contractor shall follow same procedure for Architect's approval. Subsequent work shall be in accordance with the approved sample panels.

H. Reviewed samples which may be used in the Work are indicated in individual specification sections.

I. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.9 DESIGN DATA

A. Submit electronically for the Architect/Engineer's knowledge as contract administrator or for the Owner.

B. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner. All test reports are to immediately be sent to Architect for his/her review.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application Subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect/Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data. A copy of such information will be included in the appropriate section of Close-Out Documents.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit report within 15 days of observation to Architect/Engineer for information.

C. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.14 WARRANTIES

A. Submit product or system warranty for each product submitted on. Warranties shall accompany shop drawings and submittals. The warranty must be at least to a minimum specified in individual sections, but not less than one year from date of substantial completion. Warranties will also be required as part of record documents. Refer to Section 01 77 00.

1.15 ERECTION DRAWINGS

A. Submit electronic drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 35 16

ALTERATION PROJECT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products and installation for patching and extending Work.

B. Transition and adjustments.

C. Repair of damaged surfaces, finishes, and cleaning.

1.2 RELATED SECTIONS

A. Section 01 73 29 - Cutting and Patching:

B. Section 01 50 00 - Construction Facilities and Temporary Controls: Temporary enclosures, protection of installed work, and cleaning during construction.

C. Section 02 41 19 - Minor Demolition for Remodeling: Removal and storage of products to be reinstalled by this section.

PART 2 PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

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

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

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that demolition is complete and areas are ready for installation of new Work.

B. Beginning of restoration Work means acceptance of existing conditions.

3.2 PREPARATION

A. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

E. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.3 INSTALLATION

A. Coordinate work of alterations and renovations to expedite completion to accommodate Owner occupancy.

B. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to specified condition in accordance with Section 01 73 29.

C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes in accordance with Section 01 73 29.

D. In addition to specified replacement of equipment and fixtures restore existing plumbing, heating, ventilation, air conditioning, electrical, and fire systems to full operational condition.

E. Recover and refinish Work that exposes mechanical and electrical work exposed accidentally during the work.

F. Install Products as specified in individual sections.

G. Any utility line serving existing mechanical or building equipment that is to remain in operation and is required to be temporarily removed because of the remodeling process or interference with new items to be installed shall be logically re-routed to provide continued utility service to the effected equipment. It will be the contractor's responsibility to obtain Architect's approval and coordinate rerouting and reconnection to equipment. There will be no extra cost involved with the removal, rerouting, and reconnection of these utility lines.

3.4 TRANSITIONS

A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.

3.5 ADJUSTMENTS

A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition for Architect/Engineer review.

C. Fit work at penetrations of surfaces as specified in Section 01 73 29.

3.6 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.

B. Repair substrate prior to patching finish.

3.7 FINISHES

A. Finish surfaces as specified in individual Product sections.

B. Finish patches to produce uniform finish and texture over entire area. When the finish cannot be matched, refinish entire surface to nearest intersections.

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance - control of installation.

B. Cleaning during construction

C. Tolerances

D. Protection

E. References and standards.

F. Mockup.

G. Inspecting and testing laboratory services.

H. Architect/Engineer Construction Observation Notices

I. Required Special Inspections

J. Required Pre-Installation Meetings

K. Manufacturers' field services.

L. Tobacco Use

M. Grading Certification

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittals: Submission of manufacturers' instructions and certificates.

B. Section 01 60 00 - Material and Equipment: Requirements for material and product quality.

C. Section 01 75 00 - Starting of Systems.

1.3 CRAFTMANSHIP

A. Each trade is to perform work and install products, following best standards of their industry. Work not in conformance with industry standards and quality will not be tolerated and will be subject to rejection.

1.4 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Furnish, apply, install, connect, erect, clean, and condition manufactured articles, materials, and equipment per manufacturer’s printed directions, unless otherwise indicated or specified. Comply with manufacturers' instructions, including each step-in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement. All attachment devices and materials shall be required to secure materials together or to other materials and to secure work of other trades.

H. Manufacturer’s printed directions must be on the job prior to and during installation of materials and equipment.

I. Make allowance for ample expansion and contraction for all building components subject to same.

J. Each trade shall provide sleeves, recesses and openings in their work as required to receive work from other trades.

K. Make field check of actual building dimensions before fabricating products.

L. Where proper fit of work depends upon close tolerances of manufactured products, furnish manufacturer with necessary templates to insure proper fit of all components.

M. Install materials only when conditions of temperature, moisture, humidity, and condition of adjacent building components are conducive to achieving the best installation on results.

N. Erect, install and secure building components in a structurally sound and appropriate manner. Where necessary, temporarily brace, shore, or otherwise support members until final connection or installation. Brace walls and other structural elements to prevent damage by wind and construction operations. Leave temporary bracing, shoring or other structural supports in place as long as necessary for safety and until the structure is strong enough to withstand all loads involved.

O. Where construction consists of a series of courses of units, assemble units in best acceptable manner to provide structurally sound installation, waterproof where exposed to exterior. Accurately plumb and level all courses and verify levels of frequent courses with instruments.

P. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking or other disfigurement.

Q. Unless indicated, fabricate, and install materials true to line, plumb and level. Leave finished surfaces smooth and flat or of smooth contour where indicated, free from wrinkles, warps, scratches, dents, and other imperfections.

R. Provide a quality of workmanship not less than the commercially accepted standards of that trade.

S. Where obviously of best practice, furnish materials in longest practical lengths and largest practical sizes to avoid unnecessary jointing. Make all joints secure.

T. Where fabrics, plastics and other such items join, make seams tight, secure and inconspicuous.

U. Scribe and/or otherwise neatly fit materials to adjoining materials.

V. Consult Architect for mounting height or position of any unit not specifically located.

W. Mix no more materials than can be used before materials begin to “set”. Mix no partially “set” batch with another. Clean tools and appliances prior to mixing materials to avoid contamination.

X. Conduct work in a manner to avoid injury to previously placed work.

Y. Do not disturb materials requiring curing time until appropriate curing time has transpired.

Z. Vertical & Horizontal Penetrations and Sleeves:
   1. Contractor is responsible for the layout, placement and identification of all necessary sleeves or penetrations needed to complete his work.
   2. All penetrations are to be fire stopped (where penetrating smoke and fire rated barriers) and sealed watertight prior to completion of contractor's work.
   3. All vertical sleeves or penetrations are to extend one and one half (1 ½") above the floor, slab, or housekeeping pad and be sealed watertight.

AA. Coordinate plumbing fixtures and valves with all toilet accessories to obtain proper clearances and meet ADA Guidelines at accessible locations.

BB. Contractor to be responsible for coordinating items or equipment provided by owner so that proper space and clearances are provided in newly installed work. Notify the owner if conflicts are found.

CC. During construction, if any material or product is damaged, it shall be repaired to the Architect's satisfaction. If the repair is not satisfactory, the material or product will be replaced at no additional cost to owner.

DD. Where masonry is installed, all vertical and horizontal joints align according to bond types. Where differing masonry types are installed in same wall, joints are to align between each masonry unit type unless noted otherwise.

EE. Where electrical conduit & wire, plumbing piping, fire sprinkler piping and mechanical ductwork are exposed, each trade is to install items neatly and coordinated with work of other trades. Where multiple electrical conduits or pipes protrude through walls or space, they are to be evenly spaced apart and routed in the same plane. **Do not install below finished ceiling elevation unless shown otherwise**. At exposed structure locations conduit to exit wall at top of wall at coursing directly below roof supporting bond beam. Ductwork shall be routed logically and will be installed to provide neat, clean, and aligned appearance, both vertically and horizontally.

FF. Any exposed exterior or interior plywood sheathing to be covered with temporary or permanent weather barrier within 24 hours following sheathing installation to prevent exposure to moisture or sunlight. Gypsum sheathing is to be covered with temporary or permanent weather barrier within minimum time allowed by sheathing manufacturer.

GG. Schedule work so that installed weather barriers at roofs and walls are not exposed to moisture, wind, or sunlight any longer than what the weather barrier manufacturer allows. Replace any weather barrier damaged by these elements.

HH. No items including millwork and ceiling grid are to be installed against or on walls prior to the final coat of paint being applied.

1.5 CLEANING DURING CONSTRUCTION

A. Contractor to keep building and site reasonably free of debris during construction, including mud and dirt inside building. Provide means for keeping mud and clay off floors that are to remain unfinished or clear sealed only.

B. If a floor sweep product is used, use only a wax base product. **Oil base products are not to be used.** Verify with floor covering and adhesive suppliers and obtain approval of floor sweep product so that warranty is not jeopardized.

1.6 DUST CONTROL DURING CONSTRUCTION

A. Contractor to keep dust on site to a minimum the entire duration of construction by means of regular watering. This will include dust created by grading operations, vehicular traffic, and wind. Also comply with SWPPP requirements.

B. Contractor to sprinkle work with water during demolition operations to minimize dust. Provide hoses and water connections for this purpose.

1.7 MATERIALS STORAGE

A. Limit site storage for construction materials in a central, secured area, within the boundaries of construction area. Assume full responsibility for protection of same.

1.8 APPROPRIATE MATERIALS

A. No materials containing asbestos fibers shall be allowed in any construction materials used in this project. General Contractor shall provide written certification to this effect at the end of the project. Certification shall be included in the project close-out documents. Refer to Section 02 26 23.

B. Should the General Contractor or any subcontractors discover materials that must be disturbed and are suspected of containing asbestos fibers or hazardous material, immediately notify the Architect. No disruption of such materials shall be attempted.

1.9 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerance to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

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

1.10 PROTECTION

A. Protect installed materials to prevent damage until substantial completion and comply with individual specification sections pertaining to protection of finished products.

B. No gypsum board, batt insulation, or materials prone to damage by moisture, mold and/or mildew will be installed prior to enclosing and drying in of building.

C. During construction, if any material is damaged after installation because of moisture, mold and/or mildew, it shall be replaced immediately.

D. Prior to installation and/or application of interior finishes, the building will be completely enclosed, dried in and conditioned continually to meet minimum temperature and humidity requirements for finished product installation/application.

1.11 REFERENCES AND STANDARDS

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes. The contractor is to be familiar with all standards pertaining to project.

B. Conform to reference standards at date of invitation to bidders.

C. Obtain copies of standards when required by the Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

F. Neither the contractual relationship, duties, nor responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

1.12 REFERENCES

A. Reference to technical society, organization or body is made in these specifications in accordance with but not limited to the following:

AIA	AMERICAN INSTITUTE OF ARCHITECTS
ACI	AMERICAN CONCRETE INSTITUTE
ADA	THE AMERICANS WITH DISABILITIES ACT
AEC	ARKANSAS ENERGY CODE
AFGG	ARKANSAS FUEL GAS CODE
AFPC	ARKANSAS FIRE PREVENTION CODE
AIEE	AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AMC	ARKANSAS MECHANICAL CODE
APC	ARKANSAS PLUMBING CODE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS, INC.
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AWSC	AMERICAN WELDING SOCIETY CODE
AWI	ARCHITECTURAL WOODWORK INSTITUTE
IBC	INTERNATIONAL BUILDING CODE
IMC	INTERNATIONAL MECHANICAL CODE
IPC	INTERNATIONAL PLUMBING CODE
NBFU	NATIONAL BOARD OF FIRE UNDERWRITERS
NBS	NATIONAL BUREAU OF STANDARDS
NEC	NATIONAL ELECTRIC CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHA	OCCUPATIONAL SAFETY & HEALTH ACT OF 1970
UL	UNDERWRITERS' LAB

1.13 MOCK-UP

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

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

C. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

D. Wall Mock-Ups: Construct mock-ups of wall assemblies in "cut-away view, showing each step and material or the assembly (i.e., CMU wall, sheathing, weather barrier, thru-wall membrane flashing, cavity insulation system, and wall finish material). Also show typical weather barrier installation(s) at wall openings.

1.14 TESTING SERVICES

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field or laboratory tests where specified herein, the costs of such being paid for by the contractor, unless specifically stated otherwise. FOR TESTING PAID FOR BY CONTRACTOR, THE PROPOSED TESTING LABORATORY/ENGINEER MUST BE APPROVED BY THE ARCHITECT NO LATER THAN 10 DAYS PRIOR TO BID OPENING. If certain tests are to be paid for by others, the General Contractor will remain responsible for scheduling and coordinating their tests at appropriate times.

B. Should such test or visual observation indicate failure of the materials or construction to meet requirements of the drawings and or specification, Contractor is to make additional tests as directed by the Architect, until compliance has been achieved. If such work should fail to comply, Contractor shall replace it at his expense. Charges for this additional testing will be paid for by the Contractor.

C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Architect/Engineer and Contractor at the same time, indicating observations and results of tests and indicating compliance or noncompliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing does not relieve Contractor to perform Work to contract requirements.

1.15 NOTICE FOR ARCHITECT/ENGINEER OBSERVATION

A. Whenever specifications require the contractor to have any part of the work observed and approved by the Architect, THE CONTRACTOR SHALL GIVE THE ARCHITECT A MINIMUM 24 HOUR NOTICE as to when that part of the work will be ready for observation. No part of weekends or holidays shall be counted as part of the required hours of notice. If the schedule of work has changed after notification, immediately notify Architect to inform him of change. The following is a partial list of items requiring Construction Observation. This is a general listing; your specific project may not contain some of the items listed. Refer to each individual specification section for additional observation requirements:
   1. **Sanitary Sewer Line**: 24 hr 10’ standpipe, proper bedding, proper clearances from water lines
   2. **Domestic Water Line**: 24 hr city wall pressure or 75 psi air pressure test, proper bedding, proper clearance from sanitary sewer lines.
   3. **Footing Inspections**: Count rebar and sizes, clearances, clean trenches, proper supports, proper clearances for drain lines & conduit.
   4. **Slab on Grade**: vapor barrier, taping, extension to adjacent pours, wire mesh placement, proper supports, concrete slab depth, termite spray application (dyed)
   5. **Roof Deck**: structural engineer / architect is to inspect welds and side-lap fasteners.
   6. **Wall and Above Ceiling**: correct insulation, mechanical and electrical engineers are to inspect conduits, ducts etc. prior to closing in walls.
   7. **Masonry**: Mason to prepare mock sample for review prior to starting masonry on job site
   8. **Gas Line**: 15psi, 24hr or as required by governing jurisdiction if more stringent.
   9. **Through Wall Flashing**: Inspection of surfaces, laps, termination bar installed and sealed, alignment with masonry face.

1.16 REQUIRED SPECIAL INSPECTIONS

A. When required by local or governing jurisdiction, the contractor will arrange with testing company, special inspections in accordance with Chapter 17 of the International Building Code. Owner is to pay for special inspections. Contractor to coordinate.

1.17 REQUIRED PRE-INSTALLATION MEETINGS

A. When noted in individual Specification Sections, on-site pre-installation meetings will be scheduled and held by the Contractor prior to installation of system, product or material. Installation of items is not to begin until meeting is held. Each specification Section should state the people that are required to attend each meeting.

1.18 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations.

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

D. Refer to Section 01 33 00 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

1.19 TOBACCO USE

A. **Absolutely no tobacco or e-cigarette use is permitted inside new or existing building areas throughout construction of project.** No tobacco or e-cigarette use is permitted on entire site at anytime while present on public school property.

1.20 FINISH GRADING AND SITE STRUCTURE PLACEMENT CERTIFICATION

A. Contractor to provide and pay for the services a surveyor licensed in the state which the work is to be performed, approved by the Architect, to certify that finish grade elevations and building and site structure locations are as per drawings and specifications. The Civil Engineer of record would be the preferred Surveyor, but not mandatory. Criteria for verification shall be, but not limited to the following:
   1. Finish elevation of grading about perimeter of building, finish spot elevations shown on grading plan, and general site grading.
   2. Finish elevations of paving areas, sidewalks, finished floor elevation of new building(s), and other site structures.

3. Location of new building(s).
4. Finish elevations shall be checked by string line at not more than 50 feet on center. Tolerance of not more than 0.10 feet will be permitted.

B. Any items found out of compliance with the drawings and specifications are to be identified, stated, and shown as to how it differs from intended elevation and/or location. All spot elevations are to be shown on a grading plan submitted by a surveyor.

C. Items found out of compliance with the drawings and specifications will be subject to rework or adjustment as determined by the Architect and certified by Surveyor as corrected. Provide a letter and drawing from surveyor stating and showing that grades and locations are within tolerances per specifications.

D. Final certification, showing all items within tolerances shall be submitted to and approved by Architect before Final payment will be released. Certification shall also be included for project closeout, Section 01 77 00.

E. Grade and site structure elevations found to not be in compliance with intended grades after certification shall be corrected by grading contractor under this contract and re-certified as correct.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

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

3.2 PREPARATION

A. Clean substrate surfaces prior to applying the next material or substance.

B. Seal cracks or openings of substrate prior to applying the next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

D. Temporary Equipment

1.2 RELATED SECTIONS

A. Section 01 77 00 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY

A. Cost: By Owner; connect to Owner's existing power service. Do not disrupt Owner's use of service. Owner will pay cost of energy used. Exercise measures to conserve energy.
   1. Provide temporary electric feeder from existing building. Do not disrupt Owner's use of service.
   2. Complement existing power service capacity and characteristics as required.
   3. Contractor is to field verify adequate existing power. If project requires additional power not available on site, contractor to provide at no additional cost to Owner.

B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

C. Provide main service disconnect and over current protection and meter at convenient location.

D. Permanent convenience receptacles may be utilized during construction. Damage done to receptacles and cover plates during construction period shall be repaired and or replaced.

E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 foot candle lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain 5-foot candles of lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may be utilized during construction.

1.5 TEMPORARY HEATING

A. Contractor is to provide and pay for heating devices and heat from electric utility or gas utility as needed to maintain specified conditions for construction operations until project is substantially complete as determined by Architect and/or Owner. Contractor to make ready permanent heating system to supply heat to building as soon as system is tested and operational and pay for operation of permanent heating system until project is substantially complete as determined by Architect and/or Owner. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Contractor is to double filter at return air during construction. Refer to Specification Division 23 for additional requirements during construction. Contractor shall continue to pay for this temporary service until project is accepted by owner. **Warranty period shall not begin until Certificate of Substantial Completion is issued.**

B. Maintain minimum ambient temperature between 50 and 70 degrees F during working hours and 35 degrees F at other times in areas where construction is in progress, unless indicated otherwise in product sections.

1.6 TEMPORARY COOLING

A. Utilize Owner's new cooling plant may be used when it becomes available. Extend and supplement with temporary cooling devices as needed to maintain specified conditions for construction operations. Warranty period shall not begin until Certificate of Substantial Completion is issued.
   1. Owner will pay cost of energy used. Exercise measures to conserve energy. Provide separate metering and reimburse Owner for cost of energy used. Enclose building

prior to activating temporary cooling in accordance with the Exterior Enclosures article in this section.

B. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Just prior to turning building or portions of building over to owner, contractor will replace all filters on equipment that was used for temporary ventilation, heat, or cooling during construction. Double-filter at return air during construction.

D. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.7 TEMPORARY VENTILATION

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

B. Utilize existing ventilation equipment as it becomes available. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.8 TELEPHONE SERVICE

A. Contractor to have cellular telephone service at time of project mobilization.

A. Equipment to remain in operation until project substantial completion is issued.

1.9 FACSIMILE/COMPUTER E-MAIL SERVICE

A. Provide, maintain and pay for computer to contractor’s office at time of project mobilization.

A. Equipment to remain in operation until project substantial completion is issued.

1.10 TEMPORARY WATER SERVICE

A. Owner will provide water from existing water source (i.e. hose bibb) Exercise measures to conserve water. If additional water demand becomes necessary, contractor will be responsible for providing and paying for temporary service. Contractor to verify existing water source is available and adequate for his needs prior to bid date.

1.11 TEMPORARY SANITARY FACILITIES

A. Provide and maintain the required facilities and enclosures. Existing facility use is not permitted. Provide at time of project mobilization. Maintain disposal service on a weekly basis and more often as required.

1.12 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways if required per International Building Code Section 3306 and as required by governing authorities for public right-of-way.

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

1.13 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide a minimum 8-foot-high fence around construction site per requirements of International Building Code Section 3306; equip with vehicular and pedestrian gates with locks. The contractor shall be responsible for compliance with this requirement.

1.14 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Remove ice and snow as necessary for safety and proper execution of work.

B. Protect site from puddling or running water.

C. The contractor is to comply with the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, AR Ann. 8-4-101 et seq.), and the Federal Clean Water Act [33 U.S.C. 1251 et seq.]

1.15 EXTERIOR ENCLOSURES

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

B. Provide secure temporary partitions to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

C. Temporary Construction: Framing with sheet materials unless more specifically called for on drawings, with closed joints and sealed edges at intersections with existing surfaces.

1.16 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

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

C. Provide protective coverings at walls, top of cavity walls, projections, jambs, sills, and soffits of openings.

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

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

F. Prohibit traffic from landscaped areas.

G. In cold weather, protect work from damage from frost and freezing. In hot weather, protect work from rapid drying out.

H. Protect previously placed work by suitable coverings or other protection during installation of subsequent work. Immediately clean off any foreign materials accidentally deposited on finished surfaces and where such would stain, corrode, or otherwise disfigure work.

I. Support no runways, ramps, or construction equipment on, nor transport over any items or assemblies subject to displacement, disfigurement, or other damage to finished surfaces.

J. Brace all construction to prevent damage or failure from wind.

1.17 SECURITY

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

B. Coordinate with Owner's security program.

1.18 ACCESS ROADS

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

B. Provide means of removing mud from vehicle wheels before entering streets. Streets shall be cleaned on a regular basis of mud and gravel soiled as a result of construction activities. Local requirements shall also be followed in maintaining cleanliness of streets.

C. Designated existing on-site roads may be used for construction traffic. Contractor will be responsible for repairing any damage to existing roads as a result of construction traffic. Road inspection shall be conducted prior to beginning of construction by Owner, Architect, and Contractor.

D. No personal vehicles will be allowed in secure areas. All vehicles are subject to search.

1.19 PARKING

A. Owner will provide temporary gravel surface parking areas to accommodate construction personnel.

B. Coordinate parking for workers with owner.

C. All vehicles will be subject to search.

1.20 PROGRESS CLEANING AND WASTE REMOVAL

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

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

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

D. Collect and remove waste materials, debris, and rubbish from site weekly, or more often if needed, and dispose off-site.

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

1.21 FIELD OFFICES AND SHEDS

A. Office: For use by Contractor and Architect/Engineer, Weather tight, with lighting, electrical outlets, phone facsimile machine, heating, cooling, and Janitor service, and equipped with minimum 2 chairs, marker board/chalkboard, drawing rack, and drawing display table. Adequate size trailer will also be acceptable. The Field Office is to remain the property and/or responsibility of the Contractor.

E. Provide space for Project meetings, with table and chairs to accommodate all anticipated persons attending.

F. It shall be the Contractor's responsibility to secure placement for field office staging and material storage areas either on or off site for the accomplishment of the construction and to pay any associated fees.

1.22 TEMPORARY EQUIPMENT

A. Contractor is to provide temporary elevators, hoists, walks, ramps, ladders, runways, scaffolding, shoring, bracing, and other equipment required for proper progress of project work.

B. Each subcontractor is to provide proper equipment necessary to perform and complete work associated with his trade.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, and all other temporary items prior to Substantial Completion inspection.

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

C. Restore existing and permanent facilities used during construction to original or specified condition as indicated on drawings and specifications.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 60 00

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.2 RELATED SECTIONS

A. Section 01 40 00 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

B. Provide interchangeable components of the same manufacturers for components being replaced.

1.4 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

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

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.

D. For exterior storage of fabricated Products, place on sloped supports above ground.

E. Provide bonded or insured off-site storage and protection when site does not permit on-site storage or protection.

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

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

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

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

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

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

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

1.7 ALTERNATE SUBSTITUTIONS

A. In general, these Specifications identify the required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification; the first-named manufacturer's product used as the basis for design; other named brands considered acceptable for the application by Architect. Alternate brand manufacturers named must furnish products consistent with the specifications for the first-named product, as determined by Architect. Base Proposal shall include only those brands named, except as hereinafter provided.
   1. Submit product data and specifications.
   2. Submit color samples if color selection is required or specified.
   3. Provide a list of locations and contacts with telephone numbers of local installations.
   4. Provide qualifying comparison, comparing specifications of specified product to proposed substitution.

   If any of these items are not provided, proposed substitution will be rejected.

B. Where materials or equipment are described but not named, provide required first-quality items, adequate in every respect for the intended use, such items subject to Architect's approval prior to procurement.

C. Prior to receipt of proposals, should Contractor wish to incorporate in Base Proposal brands of products other than those named in Specifications, **he shall submit written request for substitution with required information to Architect not later than ten (10) days prior to date proposals are due.** Architect will consider requests and items. If proposed substitution is approved, it will be listed in an addendum issued to principal Proposers.

D. After execution of Owner-Contractor Agreement, alternate substitution of product brands for those named in Specifications will be considered, only if (1) request is received within thirty (30) calendar days after Contract date and request includes statement showing credit due Owner, if any; if substitution product is used, (2) Owner requests consideration be given to substitute brands, (3) Proposer provides qualifying comparison, comparing specifications of specified product to proposed alternate substitution. If this is not provided, the proposed substitution will be rejected. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents. Materials and equipment proposed for substitution shall be acceptable by Architect to that specified in regard to construction, efficiency, utility, aesthetic design, and color. The Architect's decision shall be final and without further recourse. The physical size of substitute brand shall not be larger than the space provided for it. Requests must be accompanied by full description and technical data, in two copies, including manufacturer's name, model, catalog number, photographs or cuts, physical dimensions, operating characteristics, and any other information necessary for comparison.

F. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

G. A request constitutes a representation that the Bidder: / Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Will provide the same warranty for the Substitution as for the specified Product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.
   5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities if required.

H. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, specifications section states that no substitutions are allowed for a specific material or item, or when acceptance will require revision to the Contract Documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittals.

B. Section 01 11 00 - Summary of Work: Work by Owner or by separate Contractors.

C. Section 01 35 16 - Alteration Project Procedures: Cutting and patching for alterations work.

D. Section 01 60 00 - Material and Equipment: Product options and substitutions.

E. Section 07 84 13 - Fire stopping.

F. Individual Product Specification Sections:
   1. Cutting and patching incidental to work of the section.
   2. Advance notification to other sections of openings required in work of those sections.
   3. Limitations on cutting structural members.

1.3 SUBMITTALS

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

B. Include in request:
   1. Identification of Project.
   2. Location and description of affected Work.
   3. Necessity for cutting or alteration.
   4. Description of proposed Work and Products to be used.
   5. Alternatives to cutting and patching.
   6. Effect on work of Owner or separate Contractor.
   7. Written permission of affected separate Contractor.
   8. Date and time work will be executed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTIONS

3.1 EXAMINATION

A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing Work, assess conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary support to ensure structural integrity of the Work. Provide devices and methods to protect other portions of the Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

C. Maintain excavations free of water.

3.3 CUTTING

A. Execute cutting and fitting including excavation and fill if required, to complete the Work.

B. Remove and replace defective or nonconforming work.

C. Remove samples of installed work for testing when requested.

D. Provide openings in the Work for penetration of mechanical and electrical work.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

A. Execute patching to complement adjacent Work. Match with existing finish where exposed to view unless noted otherwise.

B. Fit Products together to integrate with other Work.

C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

D. Employ skilled and experienced installer to perform patching for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Restore work with new Products in accordance with requirements of Contract Documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire resistant material in accordance with Section 07 84 00 to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish the entire unit.

END OF SECTION

SECTION 01 75 00

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.2 RELATED SECTIONS

A. Section 01 40 00 - Quality Control: Manufacturers field reports.

B. Section 01 77 00 - Contract Closeout: System operation and maintenance data and extra materials.

C. Division 23 – Heating, Ventilation, and Air Conditioning

1.3 STARTING SYSTEMS

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

B. Notify Architect/Engineer seven days prior to start-up of each item.

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

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

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

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

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.

B. Demonstrate Project equipment and instruct the owner’s representative by a qualified manufacturers' representative who is knowledgeable about the Project.

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

D. Utilize operation and maintenance manuals as the basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

F. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is specified in individual sections.

H. Contractor to provide DVD recording of all training sessions with Owner personnel. A copy of the recorded training sessions is to be given to the Owner included in the closeout documents.

1.5 TESTING, ADJUSTING, AND BALANCING

A. The Contractor will employ services of an independent firm to perform testing, adjusting, and balancing. Contractor shall pay for services.

B. The independent firm will perform the services specified in Division 23.

C. Reports will be submitted by the independent firm to the Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with the requirements of the Contract Documents.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTIONS Not Used.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Spare parts and maintenance Products.

G. Warranties and Guarantees.

H. Maintenance service.

1.2 RELATED SECTIONS

A. Section 01 50 00 - Construction Facilities and Temporary Controls: Progress cleaning.

B. Section 01 75 00 - Starting of Systems: System start-up, testing, adjusting, and balancing.

1.3 CLOSEOUT PROCEDURES

A. Contractor shall notify Architect ten (10) days prior to the date on which the building will be ready for final inspection and prepare his own punch list of items to complete to meet contract documents. Such notice shall not be made until completion of all items is assured, and has submitted completed punch list items to Architect. Architect will not schedule inspection for punch list until Contractor's completed punch list is received and each item is initialed by contractor as complete.

B. Incomplete work found during the inspection shall be grounds for ceasing the inspection. Final inspection shall be resumed again only upon completion of work.

C. Minor adjustments and corrections to work shall not be considered cause for discontinuing final inspection.

D. Upon receipt of punch list prepared by Architect, the Contractor will immediately make necessary corrections to work as required for final completion of the project.

E. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

F. Provide submittals to Architect / Engineer that are required by any governing or other authorities.

G. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The final application for payment will not be approved for payment by the Architect until the “COMPLETE CLOSEOUT” documents are provided to and reviewed by the Architect by the Contractor.

H. Owner will occupy all portions of the building as specified in Section 01 11 00.

1.4 FINISHING

A. Adjust doors, hardware, appliances, motors, valves, controls, and other equipment for proper operation.

B. Seal exterior joints between materials to form a waterproofed and airtight enclosure.

C. Clean surface using appropriate materials and methods that will thoroughly clean but not damage materials and their finishes.

1.5 REPAIRS

A. Unless Architect grants permission to repair any defective work, remove from project any work not in accordance with Contract Documents. Permission to repair any such work shall not constitute a waiver of Architect’s right to require complete removal of defective work if repair operation does not restore quality and appearance of member of surface to Architect’s satisfaction. If permission is granted, repair according to Architect’s directions.

1.6 COMPLETED WORK

A. Completed work shall find materials structurally sound, free from scratches, abrasions, distortions, chips, breaks, blisters, holes, splits, or other disfigurement considered as imperfections for the specific material.

B. Completed surfaces shall be thoroughly clean and free from foreign materials and stains.

C. Contractor is to install, connect, service and operate permanent systems at earliest practical dates, unless otherwise directed by Architect.

D. Contractor is to provide Certification that finish grades and site structures placement is as per drawings and specifications. Refer to Section 01 40 00.

1.7 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

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

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

D. Clean permanent filters or replace disposable filters of operating equipment.

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

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

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.8 ADJUSTING

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

B. Adjust doors, hardware, appliances, motors, valves, controls, and other equipment for proper operation.

1.9 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

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

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

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications. (Actual sections of addendum items may be pasted into specification in appropriate locations.)

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent marker (i.e. new building, property line, etc.).
   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.
   6. Changes made by Addenda and modifications. (Actual sections of addendum items may be pasted onto drawings in appropriate locations.)

G. Submit to Architect in electronic media, **two (2) DVDs or Flash Drives,** containing **Record Documents as described in this section** and scanned **As-Built drawings in PDF format**, properly marked to show field modifications. **These shall include both Drawings and Specifications.** For videos asked for, provide videos on separate DVDs or Flash Drives

H. Submit to Architect as part of closeout documents in printed media, **one set of Record Documents, one hard copy set of Record Drawings (As-Built Drawings),**

I. Submit **one set** of three-ring binders containing **only** manufacturer **warranties and guarantees** for each product and system provided under this contract. Provide installer and manufacturer warranty department phone numbers and contact person if available for each product and system.

J. All paper copies of closeout items to be scanned and copied to the electronic media.

1.10 CLOSEOUT DOCUMENTS

A. Prepare DVD or Flash Drive titled "CLOSEOUT DOCUMENTS", title of project, and subject matter.

B. Submit two (2) complete Sets of closeouts and As-Built drawings in electronic format, within 60 days after final inspection.

C. Organize closeout contents, logically organized into sections as described below.

GENERAL (section tab)
Contents:

1. A Directory, listing names, addresses, and telephone numbers of Architect / Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Executed original of occupancy permit
3. Punch Lists showing items signed off as completed by Contractor.
4. Contractor's "Asbestos Free" certification letter stating that no materials have been placed in the building containing asbestos material.
5. Contractors "storm water pollution" certification letter stating that the work has been performed in compliance with the requirements of the Arkansas Water and Air Pollution Control Act and the Federal Clean Water Act.

LIEN WAIVERS (section tab)

Lien Waivers must demonstrate that the project is free of any debt or claim from any subcontractor, supplier or vendor and that the project is free and clear with the exception of monies owed the General Contractor. All subcontractors and suppliers must have been completely paid with the exception of the percentage of monies owed by the General Contractor, or payment a bond posted for each sub-contractor and supplier for whom a balance is owed. For this project, the amount is not to exceed Five Percent (5%) of their contract. Lien waiver submitted from each subcontractor and supplier is to show amount they are still owed. **These requirements are mandatory conditions to qualify for final payment.**

Contents:

1. AIA G706A - CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS
2. AIA G706 - CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
3. AIA G707 - CONSENT OF SURETY TO FINAL PAYMENT
4. Final Lien Release from each subcontractor and supplier.

WARRANTIES / GUARANTEES / BONDS (section tab)

A. Provide notarized copies, one original and one photocopy. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers. Submit warranties prior to final Application for Payment. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

B. Provider manufacturer **warranties and guarantees** for each product and system provided under this contract. Provide installer and manufacturer warranty department phone numbers and contact person if available for each product and system. This is a general listing; your specific project may not contain some of the items listed.

Contents:

1. General Contractor's Statement of Warranty
2. All manufacturer's warranties and guaranties stipulated or implied on equipment and products (i.e., prefinished metal finish, etc.)
3. One-year warranty from each subcontractor

4. Termite Protection Warranty (Five-Year)
5. Executed membrane Roofing Guarantee (Twenty-Year NDL), two-year installer's warranty.
6. FM 1-90 roof uplift compliance letter from roofer.
7. Executed Metal Roofing Guarantee (Five-Year Installer's Warranty, 20-year Finish Warranty)
8. Wood interior door: Lifetime warranty
9. Overhead sectional door warranty: (Refer to specific Specification Section)
10. Glazing warranty
11. Continuous hinges warranty: (manufacturer's lifetime warranty)
12. Lockset warranty:
13. Exit device: Three-years.
14. Door closers: 30-years
15. Suspended ceilings: 30-year limited system performance Warranty
16. Special coatings: 5-year warranty
17. Executed pre-engineered metal building 20-year weathertightness warranty. (Five-Year Installer's Warranty, 20-year Finish Warranty)
18. Hot Water Tank Warranty: (Refer to specific Specification Section and/or water heater schedule on drawings)
19. HVAC Manufacturers Warranties-(Contractor to fill out equipment warranty and registration cards and mail into manufacturer. Provide a copy of each warranty in the closeout manual.

1.11 OPERATION / MAINTENANCE DOCUMENTS

A. Submit data on DVD or Flash Drive.

B. Organize each individual section with printed title "OPERATION / MAINTENANCE DOCUMENTS", title of project, and subject matter.

C. Submit one set of volumes, within 10 days after final inspection.

D. Subdivide contents, logically organized into sections as described below, with tab titling each section. Prepare a Table of Contents for each system or material description identified as follows:

MECHANICAL (section tab)

Contents:

1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
2. Operation and maintenance instructions, arranged by system. 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 finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
g. Video on flash drive of each equipment and system training session.

3. Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air balance and test reports - see specifications.
   c. Certificates.
   d. Start up report on all major equipment items (See Division 23 of Specifications)
   e. Copies of registration and warranty cards on major equipment initiating warranty time dated the date of substantial completion and mailed by contractor as required.

ELECTRICAL (section tab)

Contents:

1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
2. Operation and maintenance instructions, arranged by system. Identify the following:
   a. Significant design criteria.
   b. List of fixtures, equipment and switch gear.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   g. Video on flash drive of each equipment and system training session.
3. Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Electrical System Test Report - see specifications
   c. Certificates / Warranties.
   d. Start up report
   e. Copies of registration cards on major equipment initiating warranty time dated the date of substantial completion and mailed by contractor as required.

MISCELLANEOUS EQUIPMENT & MATERIALS (section tab)

Contents:

1. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment or materials suppliers.
2. Operation and maintenance instructions for equipment arranged by system and subdivided by specification section. 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 finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Finish material schedule including the following:

a. Listing of all materials
b. Manufacturers of each material.
c. Color or finish supplied on each material.

4. Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Material Maintenance instructions and recommendations.
   c. Wear, finish, or misc. guarantees

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.13 CLOSEOUT SUBMITTAL LIST

The following is a list of submittals required by this section. It includes but is not necessarily limited to the following:

- All warranties guarantees and bonds as listed above.
- Record Drawings and Shop Drawings
- A Directory, listing names, addresses, and telephone numbers of Architect / Engineer, Contractor, Subcontractors, and major equipment suppliers.
- Executed original of occupancy permit
- Copy of Architect's and consultant's punch list(s) with the project manager's initials beside each item signifying that each item has been corrected.
- Contractor's "Asbestos Free" certification letter.
- Contractor's "storm water pollution" certification letter
- Contractor's "concrete placement" drawings identifying the area placed, the time and date of the placement and weather conditions.
- Finish grading and site structure placement certification
- Letter or proof stating SWPPP has been terminated for this contract from state environmental office and responsibility transferred to Building Contractor.
- AIA G706A - CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS
- AIA G706 - CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
- AIA G707 - CONSENT OF SURETY TO FINAL PAYMENT
- Final Lien Release from each subcontractor and supplier.
- General Contractor's Statement of Warrantee
- Inspection Report from Roofing Manufacturer's Representative.
- Third Party Special Inspection Reports
- Copy of HVAC Manufacturers Warranties and registration (Originals filled out and sent to manufacturer.)

- MECHANICAL, ELECTRICAL & MISCELLANEOUS EQUIPMENT

a. Directory, listing names, addresses, and telephone numbers of Subcontractors, and major equipment suppliers.
b. Design criteria.
c. List of equipment.
d. Parts lists
e. Operating instructions.
f. Maintenance instructions
g. Shop drawings and product data.
h. test reports.
i. Certificates.
j. Startup report.

- Finish material schedule including the following:
  a. Listing of all materials
  b. Manufacturers of each material.
  c. Color or finish supplied on each material.
- Owner receipt of spare parts and maintenance products. Contractor will provide list, naming all spare material, items and parts as specified in individual sections or on drawings. The contractor will deliver spare material, items and parts to the owner and ask him to sign list as proof that all items have been provided as listed.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION Not Used.

END OF SECTION

SECTION 02 26 23

ASBESTOS PRECAUTIONS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contractors' responsibilities concerning asbestos containing materials (ACM) in the existing building or systems where work is to occur.

B. Contractor's responsibilities concerning asbestos in materials, products, and equipment used in the construction project.

1.2 DISCOVERY OF ASBESTOS CONTAINING MATERIALS (ACM)

A. Unless indicated otherwise within the construction documents. ACM's are not known to be present in the existing building or system where work is to occur.

B. During the construction project, the contractor shall notify the Owner and the Architect of any portion of the work which the Contractor knows or has reason to believe contains asbestos. The Contractor shall take necessary precautions to prevent damage and release of asbestos fibers to the air.

C. Any asbestos abatement procedures shall be performed by the Owner under a separate contract.

1.3 ASBESTOS CONTAINING MATERIALS AND PRODUCTS

A. All building construction materials, products, and equipment used in the project shall be asbestos free.

B. The Contractor shall be responsible for verifying with suppliers and manufacturers that construction materials, products, and equipment used in completion of the project are asbestos free.

C. The Contractor shall provide certification (typewritten, signed and dated) to the Owner indicating that asbestos free materials, products, and equipment were used in completion of the work.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION Not Used

END OF SECTION

SECTION 02 32 00

GEOTECHNICAL SOILS REPORT

PART 1 GENERAL

1.1 SUMMARY

A. A soils investigation report has been prepared for the site of this work by GTS, Inc., Consultants, Fayetteville, AR. hereinafter referred to as the Soil Engineer.

B. Availability: The soils investigation report is bound in this specification for reference only.

C. Use of data:
   1. This report was obtained only for the Architect's use in design and is not a part of the Contract Documents. The report is available for bidders' information but is not a warranty of subsurface conditions.
   2. Bidders should visit the site and acquaint themselves with all existing conditions. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but all such investigations, shall be performed only under time schedules and arrangements approved in advance by the Architect.
   3. If a conflict should occur between the soil report and Section 31 23 00, the information in Section 31 23 00 shall govern.

PART 2 PRODUCTS Not Used

PART 3 EXECUTIONS

3.1 SUMMARY

A. Contractor shall follow the design for this work indicated by the drawings. Include all labor, equipment, and material including borrowing and disposal of waste, to accomplish final grades shown on drawings and specified herein.

B. Adjustment of work: Re-adjust all work performed that does not meet technical or design requirements but make no deviations from the Contract Documents without specific and written approval from the Architect.

END OF SECTION

Geotechnical Engineering Report

Benton County Jail Additions

1300 Southwest 14th Street
Bentonville, Arkansas
GTS Project No. 24-15065

May 8, 2024

Prepared For:

Hight Jackson Associates
5201 Village Parkway #300
Rogers, Arkansas 72758

GTS, Inc.
Geotechnical & Testing Services
www.gtsconsulting.net

Geotechnical Engineering | Construction Materials Testing | Environmental Due Diligence

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GTS, Inc.
Geotechnical & Testing Services

www.gtsconsulting.net

May 8, 2024

Hight Jackson Associates
5201 Village Parkway #300
Rogers, Arkansas 72758

Attention: Mr. Robert Synder

RE: Geotechnical Engineering Report
Benton County Jail Additions
1300 Southwest 14th Street
Bentonville, Arkansas
GTS Project No. 24-15065

Mr. Snyder:

This report provides the results of the subsurface exploration, laboratory testing and geotechnical engineering analysis performed for the planned additions to the existing Benton County Jail, located at the real property address of 1300 Southwest 14th Street in Bentonville, Arkansas. The approximate boundaries of the project site are shown in Figure 1 within this report.

We appreciate the opportunity to be of assistance to you on this project. We encourage retaining GTS, Inc. to be involved in any pre-bid and pre-construction meetings to allow GTS, Inc. to discuss the following findings and recommendations.

Please contact us if further explanation or clarification is required for portions of the report.

Sincerely,

GTS, Inc.
Geotechnical & Testing Services

Certificate of Authority No. 1251, expires 12/31/2025

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 18963
DANIEL TRAVIS WILLIS

Nathan Love, E.I. 5/8/24
Geotechnical Associate

Travis Willis, P.E. 5-8-24
Arkansas No. 18963

Copies to: Addressee (e-mail)

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PROJECT DESCRIPTION and INFORMATION

Introduction

Our services were performed in accordance with GTS Proposal No. GTS124066, authorized by Brian Jackson, President of Hight Jackson Associates on May 8, 2024. The intent of the authorized scope of services was to explore the subsurface soil/rock conditions at the project site in order to prepare recommendations for the planned building addition foundations, floor slabs, mass grading and pavement section alternatives.

Our currently authorized scope of services included evaluating the subsurface conditions at three (3) boring locations, identified as Borings B-1 through B-3. Borings B-1 and B-2 were located within the planned addition footprints (2) and advanced to depths of about 14 and 11 feet below existing grades, respectively. Boring B-3 was located within the previously-proposed parking lot expansion and extended to a depth of about 6 ½ feet below existing grade. Soil samples obtained from the borings were brought to our laboratory for further testing and analysis.

Our currently authorized scope of geotechnical engineering services will be concluded with the issuance of this Geotechnical Engineering Report.

Project Site

The project site is located at the existing Benton County Jail which is nominally located at 1300 Southwest 14th Street in Bentonville, Arkansas. The general boundaries of the project site evaluated in this report are outlined in yellow in Figure 1.

The site is recognized by Benton County as Parcel No. 01-16721-000, which occupies a total footprint area of approximately 51.8 acres. Based on aerial imagery provided in the documents referenced on the following page, the project site is currently a combination of grass-cover and pavement. Based on elevations provided within the referenced document, the site is relatively flat and has topographic elevations between about 1282 and 1281 feet above mean sea level.

Based on a cursory review of historic satellite imagery, the site was developed between 1996 and 2001 and has largely remained the same since that time.

Figure 1: General Boundaries of the Project Site

Planned Development

Our current understanding of the project is based on the following documents which were provided to GTS, Inc. (GTS) by the client:

- **An existing site layout titled "Benton County Detention Center" dated March 15, 2024, and prepared by Hight Jackson Associates.** This document includes existing topographic contour lines, utility layouts, and the general layout of the project site.

- **An untitled, undated, aerial image with building footprints overlain as well as requested boring locations.**

- **A 17-page document, titled "Sallyport and Medical Center Additions, Benton County Detention Center", dated April 2024, and prepared by Halff.** This document provides the 60% civil plans, including site plans and preliminary grading plans.

Current development plans call for two (2) separate additions to the existing Benton County Jail building: a new Medical Center and a drive-through Sallyport. Additionally, it should be noted that

the previously proposed parking lot expansion is no longer being considered as part of this development; however new pavements are planned to replace portions of the existing paved parking lot. An excerpt of the provided site plan is shown in Figure 2.

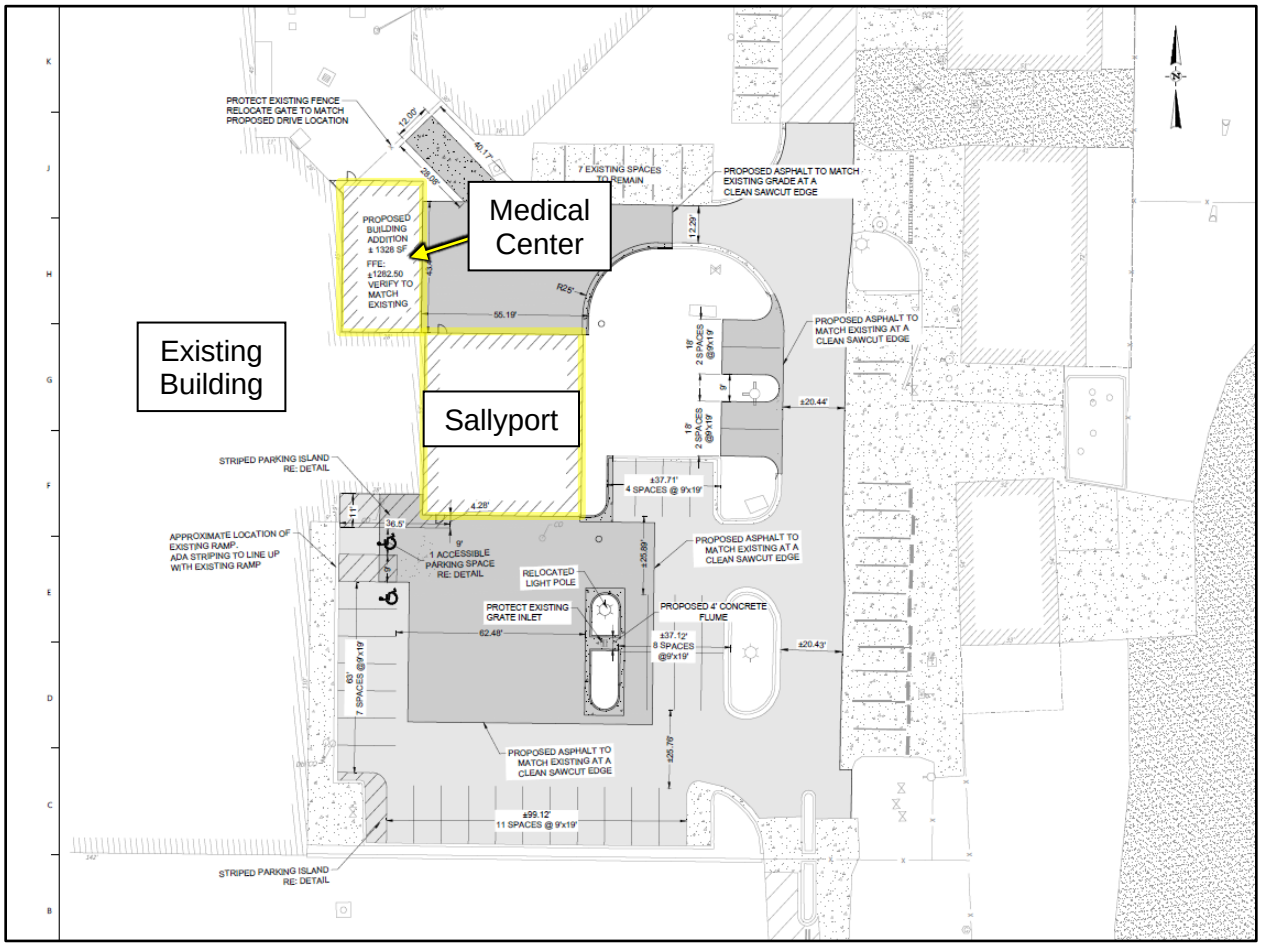


Figure 2: Excerpt of Provided Site Plan (Sheet C3.0).

GTS anticipates the planned additions will consist of either steel-, masonry- or wood-framed construction with a concrete slab-on-grade. Structural loading information was not provided to GTS prior to the issuance of this report. Therefore, we necessarily assume maximum column loads of 60 kips, maximum wall loads of 2 kips per foot, and maximum slab loading of 150 pounds per square foot.

Planned Site Grading

This report uses the terms “existing grade” and “finished subgrade”. Existing grade describes the site elevations at the time of our field drilling and sampling. “Finished subgrade” is used in this report to describe the future design elevation of the soil in the development areas upon completion of grading.

Based on the provided grading plan, we understand that the planned finished floor elevation is at about 1282.5 feet, which matches the FFE of the existing structure. Therefore, we anticipate

maximum cut/fill depths of up to 2 feet within the planned addition footprints and pavement replacement areas, to reach planned finished grades.

SUMMARY of SUBSURFACE FINDINGS

Geology

Based on the available geologic maps, the project site is located within two geologic units: the Boone Formation as well as the unit mapped as Pitkin Limestone, Fayetteville Shale (including the Wedington Sandstone member), and Batesville Sandstone (including the Hindsville Limestone Member). The overburden soils appeared to be more consistent with the latter formation, which is described in detail below:

> *The Pitkin Limestone Formation is represented by a fine to coarse grained, oolitic, bioclastic limestone. Minor chert is sometimes found near either the top or bottom of the interval and minor sandstone has been reported near the top of the unit in the northwest. The thickness ranges from a thin edge to over 400 feet.*
>
> *The Fayetteville Shale Formation is a black, fissile, concretionary, clay shale. The Fayetteville Shale Formation is known to rest conformable on the Batesville Sandstone Formation. The thickness ranges from 10 to 400 feet.*
>
> *The Batesville Sandstone Formation is an often flaggy, fine to coarse grained, cream colored to brown sandstone with thin shales. The thickness is quite variable, ranging from a feather edge to over 200 feet*.

Surface

The site surface consisted of asphalt pavement at Boring B-1, with an existing pavement section measured to be about 4 inches of asphalt over about 3 inches of base material. The surface at Borings B-2 and B-3 consisted of grass cover with an approximately 4-inch-thick rootmat. The general site conditions are shown in the photo below.

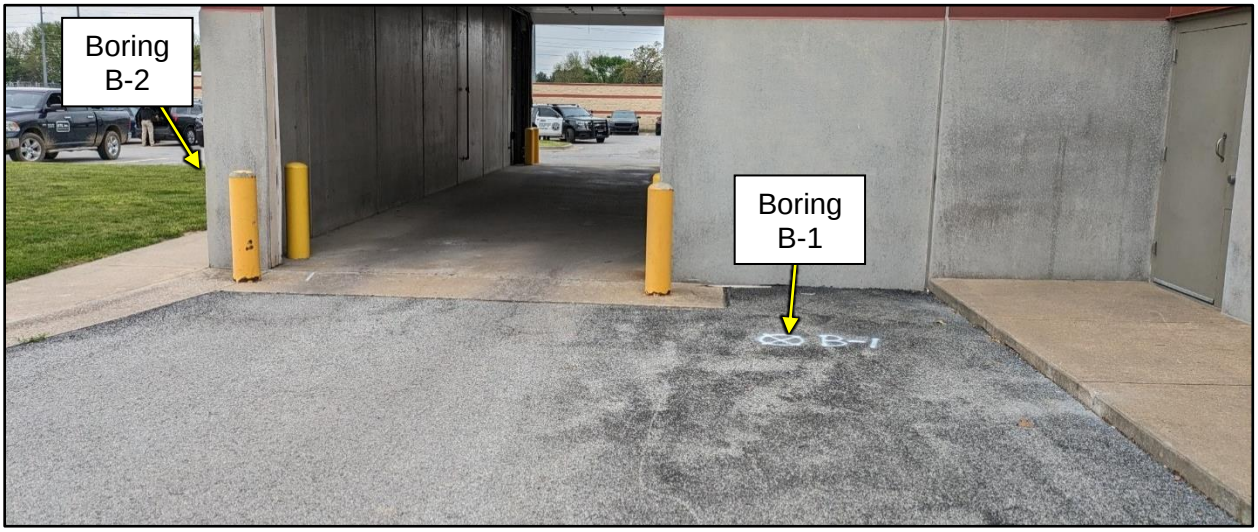


Photo 1: General site surface conditions near Boring B-1, looking south.

Subsurface Soils

Existing Fill

Existing, possible fill materials were identified immediately beneath either the pavement section or surface organics at each boring location. The fill materials consisted of silty clay and sandy lean clay soils, each with variable sand and gravel content (both chert and limestone fragments). The possible fill materials extended to depths of about 2 feet below existing grade at each boring location.

The possible fill materials had low to moderate shear strength at the time of drilling and sampling. Standard Penetration Test (SPT) N-values of 6 to 22 blows per foot of penetration (bpf) were recorded in the fill materials.

Stratum I – Clay Soils

A stratum of clay-based soils was encountered immediately beneath the existing fill materials at each boring location. More specifically, the Stratum I soils consisted of lean clay and fat clay soils, each containing varying amounts of silt and sand. The Stratum I clays extended to depths of about 11 feet and 13 ½ feet below existing grades at Borings B-2 and B-1, respectively, as well as to the terminal depth of Boring B-3, about 6 ½ feet below existing grade.

The Stratum I soils also had low to moderate shear strength during drilling and sampling, with shear strength generally increasing with depth. SPT N-values of 5 to 18 bpf were recorded within this stratum.

Stratum II – Limestone

A stratum of apparent limestone was encountered immediately beneath the Stratum I soils at the bottom of Borings B-1 and B-2, at depths of about 13 ½ and 11 feet below existing grade, respectively. GTS is currently unaware of the thickness or competency of the apparent limestone as the borings did not significantly extend into this stratum.

The Stratum II limestone had high shear strength during drilling and sampling. SPT N-values of 50 blows for 1 and 4 inches of penetration were recorded within this stratum.

Auger Refusal/Hard Drilling Conditions

Hard drilling conditions were generally encountered upon encountering the Stratum II limestone at depths of 11 feet and 13 ½ feet below existing grade at Borings B-2 and B-1, respectively. Auger refusal materials were encountered within the Stratum II limestone at a depth of about 11 feet below existing grade at Boring B-2 only. To be clear, neither hard drilling conditions nor auger refusal materials were encountered at Boring B-3, within the depths explored.

Water Measurements

Water observations were made by the drill crew during drilling and immediately after completion of drilling. The water observations made by the drilling crew are at the bottom of each boring log. Groundwater was not encountered at these times within the depths explored at any of the boring locations. The borings were backfilled after completing the field work and further water observations were not possible.

The depths to water are intended as isolated measurements of groundwater levels at the time of the field exploration. Perched water could develop within the possible fill materials which are underlain by the less permeable native Stratum I clays, as well as near the soil-rock interface. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in these soil and rock types. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below this project site.

GEOTECHNICAL ENGINEERING ANALYSIS

Geotechnical Considerations

Existing Fill

As mentioned previously, existing/possible fill materials extend from the site surface to depths of about 2 feet below existing grade at each boring location. GTS has no information regarding the placement and compaction history of the existing fill material located at the site. However, it is anticipated that it was generated during the initial site development in 2001.

Because there can be variations in the thickness, quality, and composition of existing fill and given the potential for unsuitable materials to be buried in or under the existing fill, it should be recognized that there is assumed risk of unpredictable settlement and structural performance associated with constructing shallow foundations and on-grade slabs over existing fill. This risk cannot be eliminated unless the full depth of the existing fill is removed and replaced with approved, select fill. As such, we recommend the existing fill materials (where encountered) be removed and replaced within the planned addition footprints.

Pavements span weak zones much more effectively than concentrated foundation loading. Also, clients/owners typically have a higher tolerance for cracks developing in pavements compared to building structures. Based on the results of our sample borings and our understanding of site grading, the existing fill material appears suitable for supporting typical pavement loading throughout the project site, provided the subgrade soils are stable at the time of mass grading and construction and also provided the fill is generally free of deleterious material. However, the Client/Owner should understand that some premature surface distress and increased maintenance may occur in future pavement areas supported above the existing fill. Again, this risk cannot be eliminated without completely removing and replacing the existing fill in the pavement areas with new fill.

Low-Strength Soils

Low-strength soils (SPT N-value of 6 bpf or less) were encountered within the possible fill materials as well as the Stratum I clays and extended to depths of about 2 and 3 ½ feet below existing grades at Borings B-1 and B-2, respectively. These soils are not suitable for supporting typical foundation loads, slabs-on-grade, or new fills without removal and replacement or ground improvement. Recommendations are provided in this report for ground improvement, generally through removing these low-strength soils full depth from the planned structure footprints and pavement areas and replacing them with new, approved fill material constructed as recommended in this report.

Moisture-Sensitive Soils

The on-site, silty clay and lean clay soils (Existing Fill and Stratum I soils) are susceptible to strength loss with increases in moisture content and/or when exposed to repetitive construction traffic. Ground improvement should be anticipated during wet periods of the year.

Expansive Soils

Expansive fat clay soils with moderate plasticity were encountered at Boring B-1 only, at a depth of about 8 ½ feet below existing grade. Fat clays are prone to volume changes (defined as potential vertical movement (PVM)) with variations in moisture content. Based on our understanding of the planned development as well as the subsurface conditions encountered at the boring locations, we estimate that the PVM will amount to 1 inch or less, if the recommendations provided in this report are followed. However, if more extensive layers of expansive soils are exposed at the planned bearing elevation during construction, GTS should be notified and allowed to revise the recommendations provided herein, if necessary.

Foundation Recommendations

Based on the subsurface conditions encountered at the boring locations, the understood grading scheme, and after removing and replacing any existing fill/low-strength soils full depth with new fill, the planned addition structures may be supported on a shallow foundation system. The shallow foundations should be designed as conventional, footing foundations supported directly on tested and approved, native, relatively undisturbed, medium stiff to very stiff Stratum I clays and/or select fill placed upon the approved native soils.

Shallow foundations for the planned addition structures may be designed using the information provided in Table 2 below.

Table 1: Shallow Foundation Recommendations

Maximum Net Allowable Bearing Pressure (psf)	Bearing Soil Description	Depth to Bearing Soils
2,000 (continuous and column)	Native, Medium Stiff to Very Stiff, Stratum I Clays, and/or New, Select Fill*	Expected within 2 feet of final grade after mass grading and ground improvement
* The recommended bearing soils should be relatively undisturbed and have moderate shear strength. Foundations may also be supported on select fill or Class 7 Aggregate Base Course placed and compacted above the recommended bearing materials or flowable fill poured atop suitable bearing materials.		

An allowable passive pressure of 750 psf may be used for footings cast directly against near-vertical sides in tested and approved, stiff to very stiff, lean clay (Stratum I) soils and new select

fill or for select fill compacted against the vertical footing face. Passive resistance for exterior footings should be neglected in the upper 2 feet of the soil profile unless pavement is constructed directly against the structure exterior. We recommend an ultimate coefficient of sliding friction of 0.32 for the interaction between the base of footing and soil bearing material. No safety factors have been applied to these values.

The footing foundations may provide uplift resistance for those structures subjected to wind or other induced structural loading, as is anticipated for the Sallyport addition. The uplift resistance of the footing foundation may be computed using the effective weight of the soil above the foundation along with the weight of the foundation and structure. A soil unit weight of 100 pcf may be assumed for the approved fill soils placed above the foundation, if any, provided the fill is properly compacted. If this value is critical to the design, the soil unit weight value should be further defined after the type of fill material is known and moisture-density relationship tests have been performed.

Total long-term and differential movement of shallow foundations, designed and constructed as recommended in this report and per the Mass Grading Recommendations section of this report, are estimated to be less than 1 inch and ¾ inch in 50 feet, respectively.

We estimate the differential settlement between the existing building and the new addition structures may be equivalent to the total settlement of the planned addition: up to 1 inch. If needed for the new structures, expansion joints should be provided between the existing building and the planned additions to accommodate anticipated differential settlement between the structures.

Foundation Construction Recommendations

General Dimensions

Continuous formed and isolated column foundations should have minimum widths of 18 inches and 30 inches, respectively. A minimum foundation depth of 18 inches below lowest adjoining grades should be used to protect against frost heave.

Allowable Backfill Materials

Select soil fill material, aggregate base course, and flowable fill may be used to backfill foundation overexcavations. We recommend that each lift of the select soil fill or aggregate base course material, if used to backfill foundation trench overexcavations, be field tested for in-place density and again immediately prior to the placement of reinforcing bar and concrete. Flowable fill should be field sampled and laboratory tested for strength every day of placement.

Specifications regarding these materials are shown in the Geotechnical Report Requirements and Specifications section of this report.

Stress and Bearing Interactions with Existing Building Foundations

Additionally, we understand that the planned addition structures will be adjoined to the existing structure. As-built information has not been provided to GTS regarding the existing building's foundation type or foundation bearing depth. However, GTS assumes the existing building is supported on a shallow foundation system bearing within 3 feet below existing top of adjoining ground elevations.

Care should be taken during any excavation and mass grading adjacent to existing foundations as to not disturb any existing foundation bearing materials. It is recommended, where possible, that temporary excavations below existing footings not extend below an imaginary plane extending out and down from outside edge of existing footings at a slope of approximately 1 horizontal to 1 vertical (1H:1V). Even with these criteria, excavations extending below the level of the existing foundations should be backfilled the same day they are excavated. Where this is impractical, shoring or underpinning of existing foundations may be required.

Some overlap in stress distribution from new and existing footings may occur, which may cause minor movement of the existing footings and supported structures. Maintaining a clear distance at least equal to the width of the new column spread footings between the edges of the new and existing footings, will significantly reduce this risk. **Connections between the new and existing structures should be designed to allow for the anticipated differential movement.** Again, this differential movement may be as high as the total anticipated settlement for the new addition (1 inch).

Evaluation of Supporting Material and Overexcavation Recommendations

Foundation excavations should be cleaned of loose soils, debris, and water. Soils exposed at plan bearing depths should be evaluated by GTS prior to placement of approved backfill, reinforcing bar, and concrete.

Where low-strength soils and unstable or otherwise unsuitable soils are encountered in the bottom of foundation excavations, the foundation excavations should be overexcavated until the recommended native bearing soils are exposed. Based on the understood grading plans, we anticipate that low-strength soils could likely be encountered in the bottom of footing foundation excavations in the vicinity of Boring B-2, if they are not mitigated during mass grading and site preparation.

If unsuitable bearing materials are encountered at the base of the planned footing excavation, the excavation should be overexcavated to reach suitable bearing materials. The footing could be extended deeper to bear directly on the approved bearing materials or the overexcavation could be backfilled with compacted select soil fill or aggregate base course. Alternatively, flowable fill may also be utilized.

If select soil fill or aggregate base course material is used to backfill foundation trench overexcavations, the overexcavation should extend at least 8 inches beyond the footing perimeter for every 12 inches of depth below the bottom of footing, per Figure 3. Select soil fill material should be placed and compacted as recommended in the Geotechnical Report Requirements and Specifications of this report.

If flowable fill is used to backfill foundation trench overexcavations, the excavation does not need to extend beyond the footing perimeter as shown in Figure 3. Flowable fill should be placed as soon as possible after foundation trench overexcavations are completed and the foundations have been evaluated for bearing suitability. Flowable fill should be field sampled and laboratory tested for strength every day of placement.

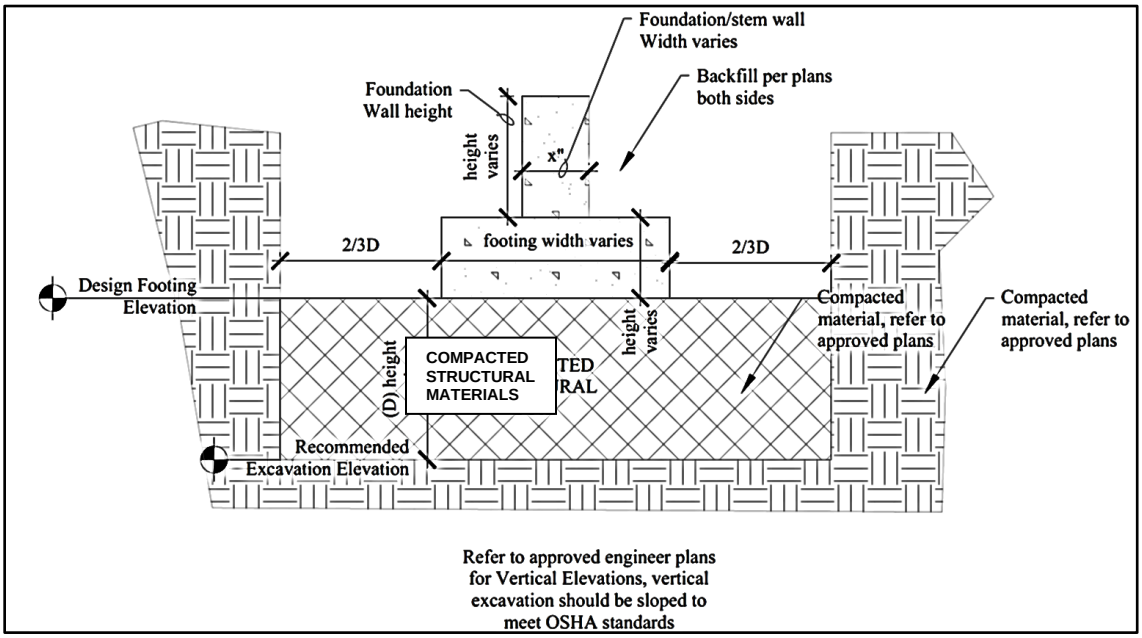


Figure 3: Foundation Trench Backfill Detail for Select Soil Fill or Aggregate Base Course

Floor Slab-On-Grade Design

Based on the understood site grading and after preparing the structure subgrade as recommended in the Mass Grading Recommendations section of this report, we expect that the existing fill will be completely removed and the floor slabs will be supported on at least 1 foot of new select fill constructed atop stable native soils. Concrete floor slabs constructed as slab-on-grade and supported on subgrade prepared as recommended in this report can be designed using a modulus of subgrade reaction (k) value of 125 pounds per square inch, per inch.

We recommend that a minimum of 4 inches of free draining gravel or sand be placed beneath the slab-on-grade to act as a capillary break. This layer is termed a “subbase” layer. To be effective as a capillary break, the subbase should have a maximum of 5 percent by dry weight passing the No. 200 sieve. The modulus of subgrade reaction value applies to the top of the subbase layer. The top of the subbase should be compacted using a vibratory plate.

If rutting of the subbase layer is a concern for concrete placement, the subbase layer may be topped with an additional 2 to 4 inches of gravel or sand having sufficient fines to allow compaction. The optional topping layer is termed the “base” layer. The base layer, if used, should be compacted to a minimum of 95 percent Standard Proctor Value (ASTM D698) at a workable moisture content that allows the density to be achieved. The base layer should have a percent passing the No. 100 sieve ranging from 10 to 30 percent by dry weight. ARDOT Class 7 aggregate base material may be used as the base layer.

A vapor barrier having a minimum thickness of 10 millimeters (mil) is recommended immediately below the concrete unless otherwise recommended by the finished flooring manufacturer or other members of the design team.

The general components of a floor slab, inclusive of the optional base course, are shown in Figure 4. The shown reinforcing steel location provides general guidance only. The location and composition of reinforcing steel should be determined by a structural engineer.

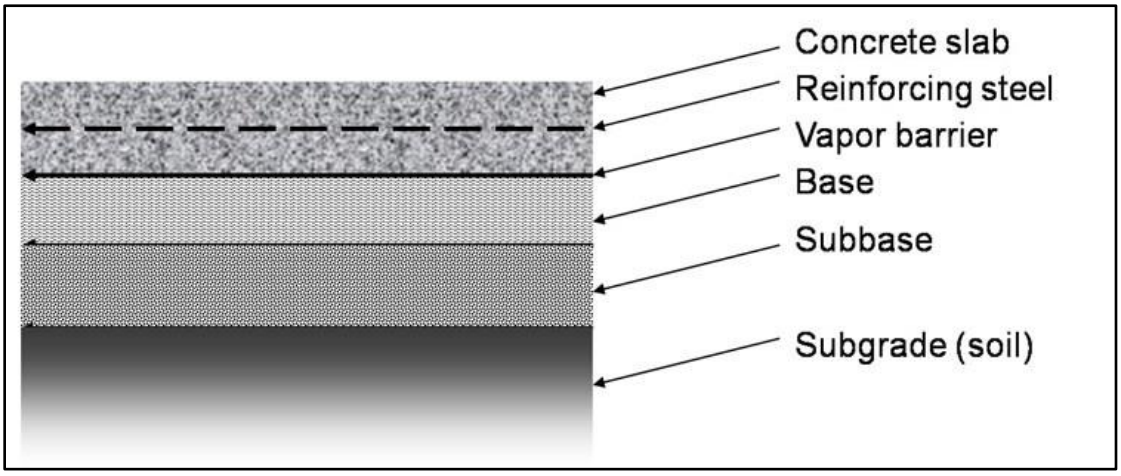


Figure 4: General Floor Slab-on-Grade Section

IBC Site Classification

Based on our knowledge of the regional geology, the results of numerous geophysical shear wave velocity tests (MASW) performed in the area, the subsurface conditions encountered at the boring locations, and after mitigating the low-strength soils, the subsurface conditions at this project site are consistent with a Site Class C per the International Building Code (IBC), 2021 Edition.

The following mapped acceleration parameters were obtained using online seismic design maps and tools provided by the Structural Engineers Association of California (SEAOC/OSHPD) at https://seismicmaps.org for ASCE 7-16 and may be used in design for the addition structures.

- S_s: 0.152 g
- S_1: 0.089 g
- F_a: 1.3
- F_v: 1.5
- S_{DS}: 0.132 g
- S_{D1}: 0.089 g
- PGA_m: 0.094 g

MASS GRADING RECOMMENDATIONS

Stripping of Surface Materials

Mass grading should extend a minimum of 5 feet outside of the structure footprints in all directions and extend throughout the planned pavement areas.

At a minimum, surface organics and silt-based soils (topsoil) should be removed from the planned areas of new development. Based on the subsurface conditions encountered at the boring locations, we estimate a stripping depth of about 6 inches to remove surface organics where grass is present. This depth does not include the depth to stump and grub of existing trees (if any). The topsoil material may be stockpiled and reused for landscaping, at the discretion of the design team.

Existing floor slabs, foundations, pavements, or other structures associated with existing and pre-existing structures should be removed full depth. Excavations to remove these structures should be backfilled as recommended in this report. The pavement and concrete may be crushed, stockpiled, and reused as fill material in non-structural areas, at the discretion of the design team.

It is our experience that properties with existing structures have a higher potential for encountering unknown conditions during mass grading and construction. These conditions include backfilled basements, trash pits, concrete foundations and underground utilities associated with the previous structures.

Buried utility lines should also be relocated or abandoned, as necessary. Excavations after removing buried utilities should be backfilled with new select fill as recommended in this report. Abandoned utility lines should be grouted and plugged.

Recommended Undercuts

As previously discussed, there is assumed risk of unpredictable settlement and structural performance associated with constructing shallow foundations and on-grade slabs over existing fill. As such, we recommend removing any existing fill materials full-depth from within the planned addition footprints. However, existing fill soils may be left in place beneath the planned pavement areas, as long as they are stable at the time of mass grading and are generally free of deleterious materials. Based on the subsurface conditions encountered at the boring locations, we anticipate average undercut depths of about 2 feet will likely be required to remove the existing fill materials full depth within the addition footprints.

In addition to the undercuts to remove the existing fill materials, we recommend that the on-site soils be undercut to a minimum depth of 1 foot below design finished subgrade elevations in the addition footprints, as well as pavement areas and replaced with new, select fill for improved and more uniform support of the floor slabs and pavements. We expect that this recommended select fill layer will already be constructed where any existing fill materials are undercut and replaced.

General Mass Grading Recommendations

After stripping surface materials, completing the recommended undercuts, and before placing new select fill, the exposed soils should be evaluated for stability by GTS.

The exposed soils should be evaluated for stability by observing overlapping passes with a loaded tandem-axle dump truck (i.e., proofrolling) weighing at least 25 tons. Where unstable soils are identified by proofrolling or testing, they should be scarified, moisture conditioned, and compacted. Alternately, the unstable soils can be removed and replaced full depth with new select fill if they cannot be effectively improved in-place. Based on the subsurface conditions encountered at the boring locations, we anticipate encountering isolated areas of unstable, low-strength soils up to 3 ½ feet below existing grade.

If the prepared subgrade should become saturated, desiccated, frozen, or otherwise damaged prior to construction of the floor slab and pavement section, the affected subgrade material should be scarified, moisture conditioned, and compacted prior to placing the aggregate base course. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab aggregate base course material.

Potential instabilities when on-site soils at the undercut depth are moist to wet are considered in the Weather and Instability Related Considerations section.

Weather and Instability Related Considerations

Soil instability is directly related to the moisture within and below the exposed soils. When moist to wet, the exposed subgrade soils will likely be unstable. If the exposed soils are unstable, they may be scarified, allowed to dry, and recompacted to achieve stability if the construction timeframe and prevailing weather conditions allow. Even with adequate time and weather, stable subgrade may not be achievable if the thickness of the unstable soil is greater than 1 to 1 ½ feet. Alternatively, unstable soils could be undercut and replaced full depth with new fill. Based on the subsurface conditions encountered at the boring locations, we recommend budgeting for undercut depths of at least 2 feet below existing grades for this project if construction is to take place during moderately wet to wet periods of the year.

Other methods of ground improvement could include cement treatment, removal of unstable materials and replacement with granular fill (with or without geogrid or geotextile), etc. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of the area requiring ground improvement, and the nature of the instability. More detailed recommendations can be provided during construction as the need for ground improvement occurs.

Fill Placement

Lifts of fill material required to reach the planned finish subgrade elevations should be composed of tested and approved fill material and placed per the specifications shown in this report. Fill should be placed in near-horizontal lifts beginning in areas requiring the deepest amount of fill. The fill should be benched into the native soils each lift. Fill should not be placed on frozen, saturated, desiccated or unstable soils.

We recommend that fill material placed within the structure footprints consist of select fill material. Additionally, select fill material, aggregate base material and flowable fill material may be used as foundation trench backfill material. Fill used in the top 1 foot of pavement subgrade should have a CBR value of 8.0 or greater. The requirements to meet for a select fill material, aggregate base material and flowable fill material are provided in the Geotechnical Report Requirements and Specifications section of this report.

Re-Use of On-Site Soils as Fill

We recommend all on-site soils and materials planned for reuse as fill, as well as all imported fill soils to be used in structural areas be thoroughly tested and evaluated by GTS before re-use.

The silty clay soils (portions of Existing Fill and Stratum I soils) and fat clay soils (deeper portion of Stratum I) may not be re-used as fill material within the footprints of the structures or in the pavement subgrade.

The on-site lean clays (portions of Existing Fill and Stratum I soils) are anticipated to be suitable for re-use as select fill material. However, if the lean clay soils become wet, they will likely require extensive drying before these soils will be suitable to be re-used as fill material. It is our experience that the re-use of lean clay soils as select fill materials is highly dependent on the experience of the contractor and the weather conditions at the time of mass grading.

We expect that the existing fill materials and Stratum I soils will be intermixed during mass site grading and excavation. We anticipate that the intermixed soil materials will likely meet the fill specifications for select fill.

However, larger, bulk samples of the on-site soils proposed for use as fill by the contractor should be thoroughly mixed, then sampled by GTS during mass grading, and laboratory tested to confirm the apparent classification of these soils, prior to re-use as fill. Imported fill should also be tested and approved prior to use as fill on this site. Imported fill containing rock will need to be screened or crushed into pieces no greater than 3 inches in any dimension prior to re-use.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Utility trenches are a common source of water infiltration and migration. If utility trenches are backfilled with relatively clean granular material,

they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Grading and Drainage

During construction, grades should be developed to direct surface water flow away from or around the site. Exposed subgrades should be sloped to provide positive drainage so that saturation of the subgrade is avoided. Surface water should not be permitted to accumulate on the site to reduce the potential for strength loss of the subgrade soils.

Final grades should be sloped away from the buildings on all sides to promote effective drainage and prevent water from ponding. Downspouts should discharge water a minimum of 10 feet beyond the footprints of the additions. This can be accomplished by using splash-blocks and downspout extensions. As an alternative, the drains could be designed to discharge to a storm water collection system. Also, the interface between the buildings and pavements or sidewalks should be effectively sealed to prevent water from infiltrating into the floor slab-on-grade subgrade.

No water was observed at the boring locations during the field exploration. If water collects in excavations, we anticipate that sump pits and suction pumps could be used to alleviate the water. The need for dewatering and dewatering system design should be based on the actual subsurface water conditions encountered at the time of construction.

Rock Excavation Potential

Rock excavation means and methods are generally not anticipated to be required based on our understanding of site grading plans. We expect that the existing fill materials as well as the native clay soils can be excavated with conventional earthwork equipment. Based on the subsurface conditions encountered at the boring locations, we anticipate difficult excavation and likely rock excavation could be required in to penetrate the underlying limestone stratum, beginning at depths of about 11 to 13 ½ feet below existing grade.

PAVEMENTS

Pavement Support Recommendations

Based on the understood site grading scheme and preparing the pavement subgrade as recommended in the Mass Grading Recommendations in this report, we expect that the pavement subgrade materials will consist of a minimum 1-foot-thick layer of new select fill. Select fill placed directly beneath planned pavements should have a laboratory California Bearing Ratio (CBR) value of 8 or greater.

As previously discussed, the new fill materials may be supported on native on-site soils or existing fill materials, as long as the owner acknowledges the inherent risks, the existing fills are stable at the time of mass grading and are generally free of deleterious materials.

Pavement Design Recommendations

No pavement loading design guidance has been provided to GTS by the design team. Therefore, the pavement sections provided in this report are based on an assumed Equivalent Single Axle Loading (ESAL) of about 50,000 for light-duty pavement sections (car and passenger truck), about 200,000 for medium-duty pavement sections (drive lanes for passenger cars and light trucks and fire lanes), and about 500,000 for heavy-duty pavement sections (drive lanes with frequent delivery/garbage trucks, fire lanes, and dumpster areas). A factor of 1.5 was used to convert flexible ESALs to rigid pavement ESALs. These values should be evaluated by the design team for appropriateness for this project site and intended pavement use.

A design modulus of subgrade reaction (k) of 125 pounds per square inch, per inch, was used for the design of the rigid pavements. A design California Bearing Ratio (CBR) of 5 was used for the design of flexible pavements, based on an average of the top 2 feet of pavement subgrade, including new fill and in-situ soils. The pavement sections assume adequate drainage will be provided to allow removal of water from the pavement structure in 24 hours or less.

The recommended flexible and rigid pavement sections are shown in Table 2 and Table 3 on the following page.

Table 2: Flexible Pavement Section Recommendations

Flexible Pavement Section:	Asphalt Surface Course (inches)	Aggregate Base Course (Class 7) (inches)	Design Traffic
Light-Duty	3	6	automobile parking areas
Medium-Duty	3	9	drive lanes for automobiles and occasional delivery/garbage truck traffic
Specification[1]	*Section 407-1*	*Section 303*	

[1] Standard Specification for Highway Construction, Arkansas Department of Transportation, Edition of 2014.

Table 3: Jointed, Plain Unreinforced Rigid Pavement Section Recommendations

Rigid Pavement Section	Unreinforced Class S(AE) Concrete (inches)	Aggregate Class 7 Base Course (inches)	Design Traffic
Light-Duty	5 ½	4	automobile parking areas
Medium-Duty	7	4	drives for automobiles and occasional delivery/garbage truck traffic and dumpster areas
Heavy-Duty	8	4	dumpster pads
Specification	*Section 501*[1]	*Section 303*[1]	

[1] Standard Specification for Highway Construction, Arkansas Department of Transportation, Edition of 2014.

The asphalt and concrete pavement design for the new drive lanes and parking lots associated with this development were calculated using the AASHTO Guide for Design of Pavement Structures, 1993 edition.

The recommended asphalt pavement section is typical of local construction practices for similar projects over the past 15 years. It should be noted that there could be some decreased performance and life span for the new asphalt pavement if actual traffic loading is higher than anticipated and particularly if there is heavy truck traffic. Arkansas references most asphalt specifications in the 1993 AASHTO guide, which is why it was used in this design.

Several national asphalt associations and states have developed alternate design guides for asphalt parking lots, several of which are guided by the increased stresses placed on a parking

lot pavement due to slower traffic speeds, increased turning traffic and long durations of static loads. The use of several of these alternate methods will provide a thicker pavement section for the same design traffic and pavement subgrade, which would increase the life expectancy of the pavement. It should be noted that several of these design methods will require a minimum of two layers of asphalt pavement (surface and binder/base courses) for both structural support and long-term rideability. The minimum pavement sections required to ensure that proper placement and compaction is achieved during construction often lead to parking lots that can support much more traffic than the design traffic, particularly for lightly loaded parking lots. If requested, GTS can provide a design based on these alternate methods.

GEOTECHNICAL REPORT REQUIREMENTS and SPECIFICATIONS

Unless otherwise stated, the recommendations contained in this report are based on the compaction specifications and material types noted in Table 4, Table 5, and the following paragraphs.

Table 4: Recommended Soil Compaction

Type of Material	Moisture-Density Specification	Minimum Dry Density (percentage of proctor)	Range from Optimum Moisture Content (%)
Soil Fill Material; and Scarified and Recompacted Native Soils	ASTM D698 (Standard Proctor)	98 (Addition Footprints) 95 (Outside Addition Footprints)	-2 to +2
ARDOT Class 7 Aggregate Base Course	ASTM D1557 (Modified Proctor)	95	Adequate to Achieve Compaction
Flowable Fill Material	AHTD Section 206	Not applicable	

Table 5: Soil Fill Material Requirements

Type of Soil Fill	Location/Use	Maximum LL	Maximum PI	USCS Classifications
Select	All Areas	40[A]	18[A]	CL, GM, GC, GP, SP, SC, Chert, Limestone

[A] Plasticity requirements may be waived provided that the fill has a minimum of 65% retained on the No. 200 sieve.

Fill material should have a maximum nominal aggregate size of 3 inches or less after placement and compaction. If there are questions regarding the effectiveness of compaction equipment breaking down the material, a test pad should be constructed using the rock fill material and observed by GTS during compaction.

Fill needed for site grading should be placed in loose lifts not exceeding 9 inches in thickness (compacted lift thickness of approximately 6 to 7 inches). We recommend the fill be tested for density every lift during site grading, with a minimum of one test every 2,500 square feet of building area and every 10,000 square feet of pavement area.

Where select soil fill or aggregate base course material is used to backfill foundation trench overexcavations up to plan bottom of foundation elevation, the fill should be tested each lift, at each column location, and every 25 linear feet of continuous foundation trench. Additionally, we recommend testing the fill for in-place density immediately before the placement of reinforcing bar and concrete.

Fill used in the top 1 foot of pavement subgrade should have a CBR value of 8.0 or greater.

Flowable fill, if used to backfill foundation overexcavations, should have a minimum compressive strength of 400 psi, and should be tested for compressive strength each day of placement.

The recommended moisture content and compaction of the fill should be maintained until fills are completed and floor slabs are constructed.

Design and construction plans should provide for rapid, positive drainage away from the structure areas both during construction and at completion of the project.

SUBSURFACE EXPLORATION and PROCEDURES

The subsurface exploration consisted of drilling three (3) boring locations, identified as Borings B-1 through B-3. Borings B-1 and B-2 were located within the planned addition footprints (2) and advanced to depths of about 14 and 11 feet below existing grades, respectively. Boring B-3 was located within the previously-proposed parking lot expansion and extended to a depth of about 6 ½ feet below existing grade.

The boring locations were established in the field by GTS using a recreation-grade hand-held GPS unit. The approximate locations are shown on the Boring Location Diagrams in Appendix A of this report. We estimated ground surface elevations from the grading plan provided to us and referenced at the beginning of this report, rounded to the nearest 1-foot increment. The estimated ground surface elevations are shown near the top of the boring logs. The locations and elevations of the borings should be considered accurate only to the degree implied by the methods used to define them. The results of the borings are provided in Appendix A.

The borings were drilled with a track-mounted Geoprobe 7822DT drill rig. Disturbed samples and estimates of the in-situ shear strength of the soil and weathered rock were obtained using an automatic-hammer-driven split-barrel sampler in general accordance with the Standard Penetration Test at the boring locations.

An automatic SPT-hammer was used to advance the split-barrel sampler in the boreholes. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The soil and rock samples obtained in the field were sealed to reduce moisture loss and taken to the GTS soil laboratory for further examination, testing, and classification.

Field logs were prepared during the drilling and sampling of the borings. These logs report sampling methods, sampling intervals, soil, rock, and groundwater conditions, and notes regarding soil, rock, and drilling conditions observed between sample depths. The final boring logs, included in this report, have been prepared based on the field logs and have been modified, where appropriate, based on the results of the laboratory test results.

LABORATORY TESTING and PROCEDURES

The soil samples were examined in the field by an experienced geotechnical engineer and classified based on the soil's texture and plasticity, in accordance with the Unified Soil Classification System. The estimated Unified Soil Classification System group symbols are shown on the boring logs.

Hand penetrometer tests were performed on select intact cohesive samples. Unfactored hand penetrometer test values are shown on the boring logs as filled squares.

The laboratory testing was performed by GTS in general accordance with the American Society for Testing and Materials (ASTM) test designations shown in the table below and the results are shown on the boring logs and are provided in Appendix B.

Table 6: Laboratory Test Method Designations

Laboratory Test	Test Designation	Method (if applicable)
Moisture Content of Soil and Rock	ASTM D2216-10	Method A
Visual Classification of Soil Types	ASTM D2488	
USCS Classification	ASTM D2487	
Atterberg Limits	ASTM D4318	Method A
Sieve Analysis	ASTM D6913	Method A

GEOTECHNICAL REPORT LIMITATIONS

The recommendations contained in this report are based on our interpretation of subsurface conditions encountered at the discrete boring locations. Variations between the subsurface conditions anticipated in this report and actual project site conditions may occur away from the boring locations.

If significant differences between the findings of the borings and site conditions are observed, GTS, Inc. should be contacted to assess the variation and, if necessary, reevaluate the recommendations contained in this report.

ENVIRONMENTAL EXCLUSION

A Geotechnical Engineering Report assesses the engineering properties of soil and rock. No environmental assessment of a project site is performed during a geotechnical exploration. If the owner is concerned about the potential for environmental hazards at the project site, additional studies should be performed by GTS, Inc.

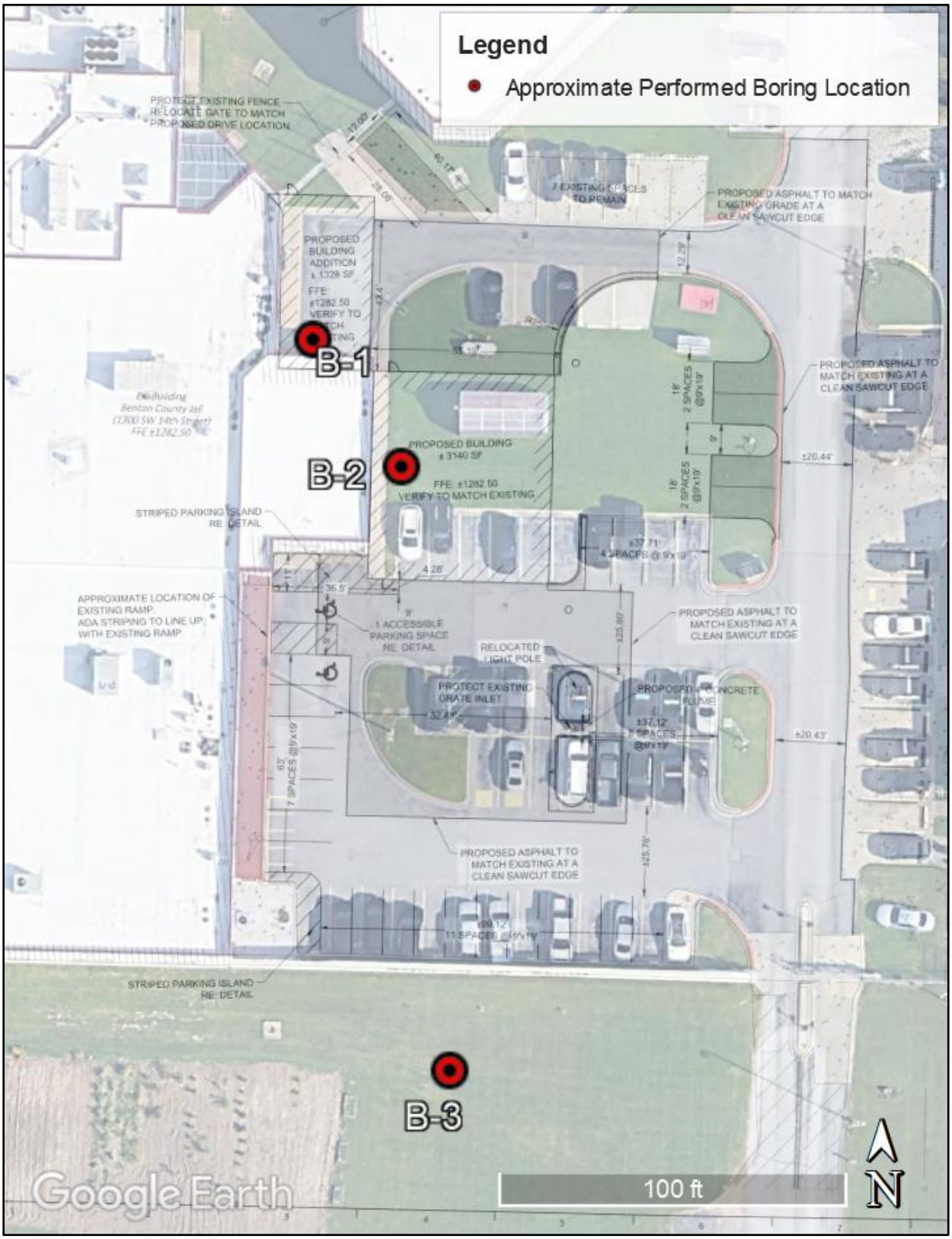
APPENDIX A

Boring Location Diagram

Boring Logs

Soil Classification Legend

Rock Classification Legend



Boring Location Diagram (with Site Plan Overlain)

LOG OF BORING NO.B-1

Benton County Jail Addition
1300 SW 14th Street, Bentonville, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 24-15065 Location: Shown on attached Boring Location Diagram, Medical Addition

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1282.0				
					ASPHALT = 4 inches El.=1281.7				
			1	12	BASE = 3 inches El.=1281.4 POSSIBLE FILL - predominantly tan and brown silty clay	FILL		●	6
2.5					El.=1280.0				
			2	12	LEAN CLAY, with sand medium stiff to stiff, brown and tan			■ 2.25	7
			3	14				■ 2.5	11
5					- very stiff below about 5 feet	CL			
			4	14				● ■	13
7.5					El.=1273.5				
			5	14	FAT CLAY, with sand very stiff, tan		77	■ 2.5	18
10						CH			
12.5					El.=1268.5				
			6	4	LIMESTONE moderately hard, moderately weathered, tan to light gray	ROCK		●	50/4"
15					El.=1268.2 BOTTOM OF BORING AT ABOUT 14 FEET				
17.5									

COMPLETION DEPTH: 13.83 ft.
DATE: 4/24/24
RIG: Geoprobe 7822DT, Track-Mounted Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-2

Benton County Jail Addition
1300 SW 14th Street, Bentonville, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 24-15065 Location: Shown on attached Boring Location Diagram, Sallyport Addition

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
					Surface Description= Grass Cover				
0					El.=1282.0				
			1	14	POSSIBLE FILL - predominantly brown and tan silty clay, with rootlets	FILL		●	22
					El.=1280.0				
2.5			2	12	LEAN CLAY, with sand medium stiff, brown and tan			■ 3.75	5
			3	14			76	■ 2.5	7
5			4	12	- stiff below about 5 feet	CL		■	9
7.5									
			5	12	- very stiff below about 8 ½ feet			■	16
10									
			6	1	El.=1271.1	ROCK			50/1"
					LIMESTONE moderately hard, moderately weathered, light gray				
12.5					El.=1271.0				
					AUGER REFUSAL AT ABOUT 11 FEET				
15									
17.5									

COMPLETION DEPTH: 11 ft.
DATE: 4/24/24
RIG: Geoprobe 7822DT, Track-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-3

Benton County Jail Addition
1300 SW 14th Street, Bentonville, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 24-15065 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 4 inches El.=1282.0				
			1	12	POSSIBLE FILL - predominantly dark brown sandy lean clay, with organics and limestone fragments	FILL		●	11
					El.=1280.0				
2.5			2	8	LEAN CLAY, with sand stiff, tan and brown			■ 2.5 →	9
			3	12		CL	71	● ■	9
5			4	16				● ■	12
					El.=1275.5				
7.5					BOTTOM OF BORING AT ABOUT 6½ FEET				
10									
12.5									
15									
17.5									

COMPLETION DEPTH: 6.5 ft.
DATE: 4/24/24
RIG: Geoprobe 7822DT, Track-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

SOIL CLASSIFICATION LEGEND

APPARENT CONSISTENCY OF COHESIVE SOILS (PECK, HANSON & THORNBURN 1974, AASHTO 1988)				
Descriptor	**SPT N_{60} (blows/foot)***	**Pocket Penetrometer, Qp (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 2	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	2 – 4	0.25 – 0.50	0.12 – 0.25	Easily penetrated several inches by thumb
Medium Stiff	5 – 7	0.50 – 1.0	0.25 – 0.50	Penetrated several inches by thumb w/moderate effort
Stiff	8 – 12	1.0 – 2.0	0.50 – 1.0	Readily indented by thumbnail
Very Stiff	12 – 30	2.0 – 4.0	1.0 – 2.0	Indented by thumb but penetrated only with great effort
Hard	> 30	> 4.0	> 2.0	Indented by thumbnail with difficulty

* Using SPT N_{60} is considered a crude approximation for cohesive soils.

APPARENT DENSITY OF COHESIONLESS SOILS (AASHTO 1988)	
Descriptor	**SPT N_{60} Value (blows/foot)**
Very Loose	0 – 3
Loose	4 – 8
Medium Dense	9 – 29
Dense	30 – 49
Very Dense	$\geq$ 50

MOISTURE (ASTM D2488-06)	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch, well below optimum moisture content (per ASTM D698 or D1557)
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table, well above optimum moisture content (per ASTM D698 or D1557)

PERCENT OR PROPORTION OF SOILS (ASTM D2488-06)	
Descriptor	**Criteria**
Trace	Particles are present but estimated < 5%
Few	5 – 10%
Little	15 – 25%
Some	30 – 45%
Mostly	50 – 100%
Percentages are estimated to nearest 5% in the field. Use "about" unless percentages are based on laboratory testing.	

SOIL PARTICLE SIZE (ASTM D2488-06)	
Descriptor	**Size**
Boulder	> 12 inches
Cobble	3 to 12 inches
Gravel - Coarse Fine	¾ inch to 3 inches No. 4 sieve to ¾ inch
Sand - Coarse Medium Fine	No. 10 to No. 4 sieve (4.75mm) No. 40 to No. 10 sieve (2mm) No. 200 to No. 40 sieve (.425mm)
Silt and Clay ("fines")	Passing No. 200 sieve (0.075mm)

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2488)				
Major Division			**Group Symbol**	**Description**
Coarse Grained Soils (more than 50% retained on #200 sieve)	**Gravel** (50% or more retained on No. 4 sieve)	Clean Gravel	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	Sand (> 50% passing No. 4 sieve)	Clean sand	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly-graded sands and gravelly sands, little or no fines
		Sand with fines	SM	Silty sands and sand-silt mixtures
			SC	Clayey sands and sand-clay mixtures
Fine Grained Soils (50% or more passing #200 sieve)	**Silt and Clay** (liquid limit < 50)		ML	Inorganic silts, rock flour and clayey silts
			CL	Inorganic clays of low-medium plasticity, gravelly, sandy & lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silt and Clay (liquid limit > 50)		MH	Inorganic silts and clayey silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

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GRAPHIC SYMBOL LEGEND		
SPT		Standard Penetration Test (2" OD), ASTM D1586
GRAB		Grab Sample
ST		Shelby Tube, ASTM D1587 (pushed)
AUGER		Boring Advanced Through Drilling
CORE		Rock coring

ROCK CLASSIFICATION LEGEND

WEATHERING DESCRIPTORS FOR INTACT ROCK (USBR, 2001)						
Descriptor	**Chemical Weathering-Discoloration-Oxidation**		**Mechanical Weathering and Grain Boundary Conditions**	**Texture and Solutioning**		**General Characteristics**
	Body of Rock	**Fracture Surfaces**		**Texture**	**Solutioning**	
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck
Slightly Weathered	Discoloration or oxidation limited to surface or short distance from fractures; some feldspar crystals are dull	Minor or complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck; body of rock not weakened
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck; body of rock is slightly weakened
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent or chemical alteration produces in-situ disaggregation	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation; rock is friable; granitics are disaggregated in semi-arid conditions	Altered by chemical disaggregation such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow; rock is significantly weakened
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregation)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand; resistant minerals such as quartz may be present as "stringers" or "dikes"

RELATIVE STRENGTH OF INTACT ROCK	
Descriptor	**Uniaxial Compressive Strength (psi)**
Extremely Hard	> 30,000
Very Hard	14,500 – 30,000
Hard	7,000 – 14,500
Moderately Hard	3,500 – 7,000
Soft	700 – 3,500
Very Soft	150 – 700
Extremely Soft	< 150

BEDDING SPACING (modified USBR, 2001)	
Descriptor	**Thickness or Spacing**
Massive	> 10 feet
Very thickly bedded	3 to 10 feet
Thickly bedded	1 to 3 feet
Moderately bedded	3-5/8 inches to 1 foot
Thinly Bedded	1-1/4 inches to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

CORE RECOVERY CALCULATION (%)

$$= \frac{\text{length of recovered core pieces}}{\text{total length of core run}} \times 100\%$$

RQD CALCULATION (%)

$$= \frac{\text{length of intact core pieces} > 4 \text{ in}}{\text{total length of core run (inches)}} \times 100\%$$

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ROCK HARDNESS (modified USBR, 2001)	
Descriptor	**Criteria**
Extremely hard	Cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Can be scratched with pocket knife or sharp pick with heavy pressure, heavy hammer blows required to break specimen
Moderately hard	Can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately soft	Can be grooved 1/16 inch with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Can be grooved or gouged with pocket knife or sharp pick with light pressure; breaks with light to moderate hand pressure
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

APPENDIX B

Laboratory Testing Results

GTS, Inc.
Geotechnical & Testing Services

1915 North Shiloh Drive
Fayetteville, Arkansas 72704

Office: (479) 521-7645

Office Locations

Fayetteville, Arkansas
Little Rock, Arkansas
Fort Smith, Arkansas
Tulsa, Oklahoma
Dallas, Texas

PROJECT: Benton County Jail Addition

DATE: 5/2/24

JOB NO: 24-15065

BORING NO.	B-1
SAMPLE NO.	S-5
DEPTH (FT)	8.5 to 10
PLASTIC LIMIT	16
LIQUID LIMIT	53
PLASTICITY INDEX	37

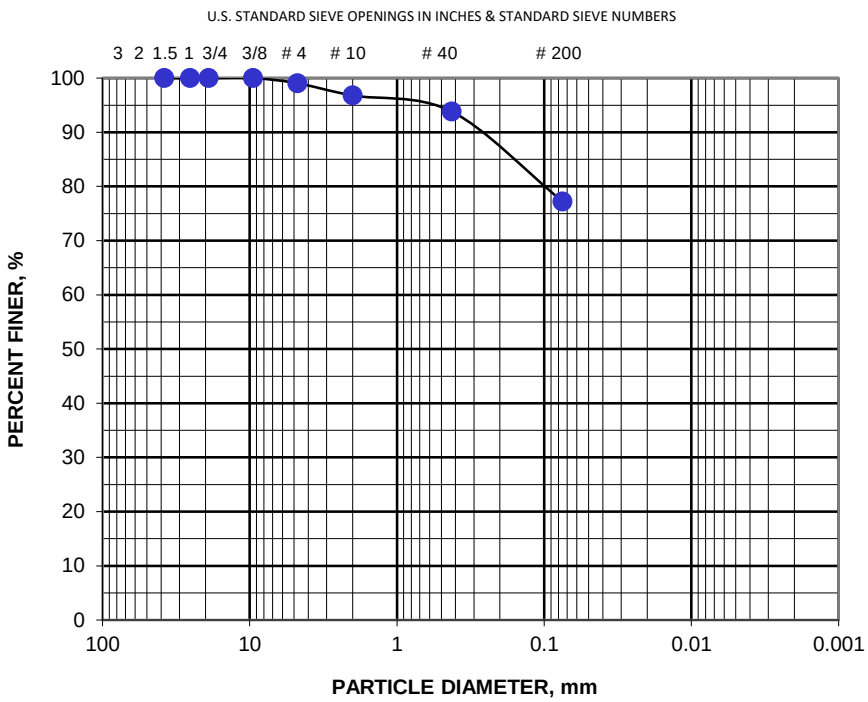
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	100.0%
No. 4	99.0%
No. 10	96.8%
No. 40	93.8%
No. 200	77.2%

MOISTURE CONTENT (%)	22.5

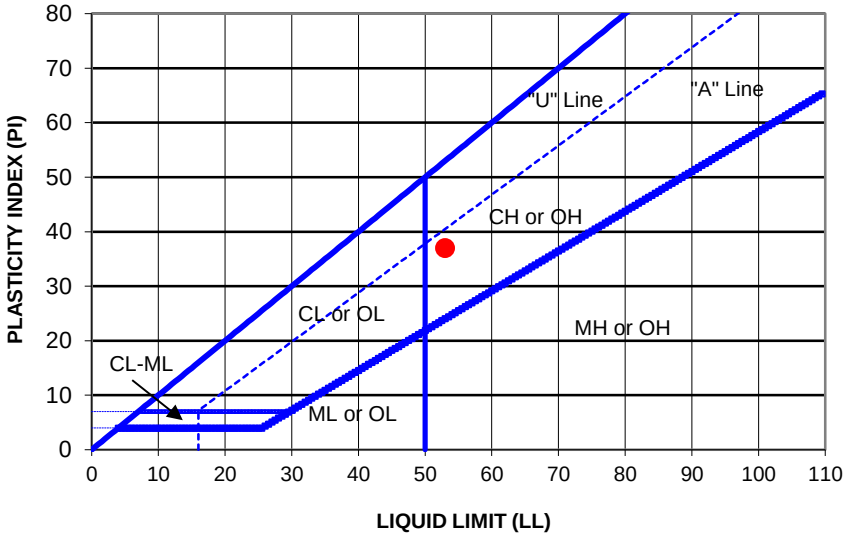
VISUAL DESCRIPTION	tan

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Fat Clay with Sand, CH	**A-7-6**	**28**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



GTS, Inc.
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Fayetteville, Arkansas 72704

Office: (479) 521-7645

Office Locations

Fayetteville, Arkansas
Little Rock, Arkansas
Fort Smith, Arkansas
Tulsa, Oklahoma
Dallas, Texas

PROJECT: Benton County Jail Addition

DATE: 5/2/24

JOB NO: 24-15065

BORING NO.	B-3
SAMPLE NO.	S-3
DEPTH (FT)	3.5 to 5
PLASTIC LIMIT	16
LIQUID LIMIT	43
PLASTICITY INDEX	27

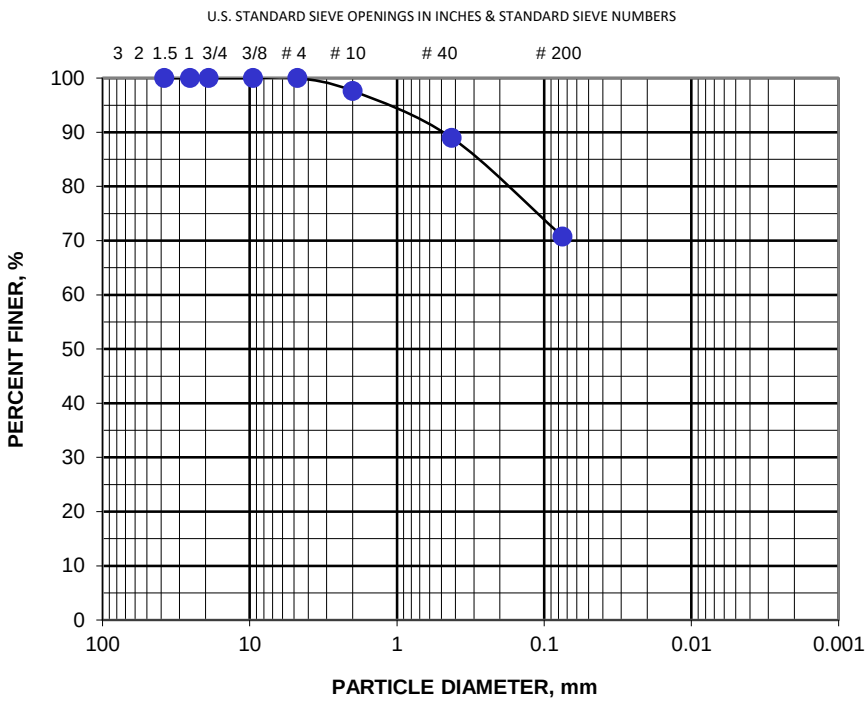
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	100.0%
No. 4	100.0%
No. 10	97.6%
No. 40	89.0%
No. 200	70.8%

MOISTURE CONTENT (%)	20.4

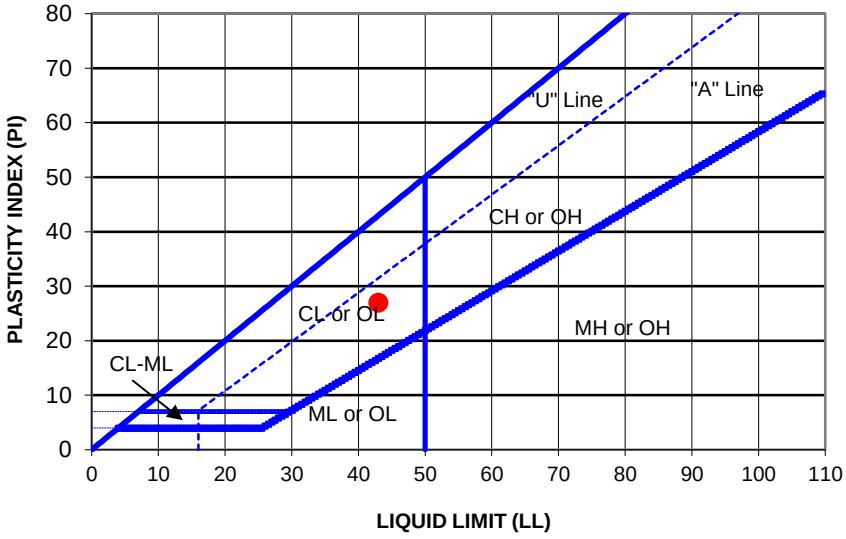
VISUAL DESCRIPTION	tan and brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Lean Clay with Sand, CL	**A-7-6**	**17**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



SECTION 02 32 01

SITE AND SUBSURFACE INVESTIGATION BY CONTRACTOR

PART I GENERAL

1.1 SECTION INCLUDES

A. Surface reconnaissance and evaluation of existing site conditions.

B. Sub-surface evaluation by contractor's chosen method of investigation.

1.2 RELATED SECTIONS

A. Sections 00 72 00 - General Conditions.

B. Section 00 73 00 - Supplementary conditions.

PART 2 GENERAL

2.1 EXECUTION

A. The Contractor is responsible for having a thorough knowledge of all Drawings, Specifications, General and Supplementary Conditions, and other Contract Documents. Failure to acquaint himself with this knowledge does not relieve him of the responsibility for performing his work in a manner acceptable to the Owner. No additional compensation will be allowed because of conditions that occur due to the failure by the Contractor to familiarize himself and all work with this knowledge.

B. The Contractor shall be responsible for determining the existing conditions of the site and shall thoroughly examine all factors reasonably available to him, including but not limited to the Drawings, Specifications, geotechnical report, site boundary and topography, site conditions, site history, local information, and seasonal weather conditions. Geotechnical report data is not considered all conclusive and it is the Contractor's responsibility to further investigate site conditions as he determines necessary. The Contractor shall be totally responsible for acceptance of the site and preparation of the site to the proper grade and compaction requirements as indicated by the Contract Documents including Construction Drawings and Specifications. Any construction performed by the Contractor on the project will constitute acceptance of the site.

END OF SECTION

SECTION 02 41 19

MINOR DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of designated building equipment and fixtures.

B. Removal of designated construction.

C. Disposal of materials. .

D. Identification of utilities.

E. Refer to items as indicated on drawings.

1.2 RELATED SECTIONS

A. Section 01 11 00 - Summary of Work: Work sequence, Owner's continued occupancy.

B. Section 01 35 16 - Alteration Project Procedures: Re-installation of removed and stored products.

C. Section 01 50 00 - Construction Facilities and Temporary Controls: Temporary enclosures, dust control barricades, security at Owner occupied areas, and cleanup during construction.

D. Section 01 77 00 - Contract Closeout: Project record documents.

1.3 SUBMITTALS FOR CLOSEOUT

A. Section 01 77 00 - Contract Closeout: Procedures for submittals.

B. Project Record Documents: Accurately record actual locations of capped utilities, subsurface obstructions, and other items field verified as different from construction documents.

1.4 REGULATORY REQUIREMENTS

A. The Contractor shall obtain evidence in writing from the Owner prior to any work commencing that no asbestos-containing material exists in the area(s) where demolition or construction is to be performed. A copy of the Owner’s asbestos survey must be available on site during any renovation or demolition activity.

.

B. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

C. Obtain required permits from the authorities.

D. Do not close or obstruct egress width to any building or site exit.

E. Do not disable or disrupt building fire or life safety systems without 2 days prior written notice to Owner.

F. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.5 SCHEDULING

A. Section 01 33 00 - Submittals, 01 32 36 Progress Schedules: Work schedule.

B. Schedule Work to coincide with new construction.

C. Describe demolition removal procedures and schedule.

D. Performance of noisy work must be coordinated with the Owner.

1.6 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Cease operations immediately if the structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. After date of Notice to Proceed, Contractor to assume responsibility for structures and items to be demolished and removed until such work is completed to the satisfaction of the Owner's representative. After work is started on any building or structure, work shall continue without interruption until complete.

B. Provide, erect, and maintain temporary barriers and partitions at locations as required and indicated.

C. Erect and maintain weatherproof closures for exterior openings.

D. Erect and maintain temporary partitions to prevent the spread of dust, odors, and noise to permit continued Owner occupancy and security.

E. Protect existing materials and items which are not to be demolished.

F. Prevent movement of structure; provide bracing and shoring.

G. Notify affected utility companies before starting work and comply with their requirements.

H. Mark location and termination of utilities.

I. Provide appropriate temporary signage including signage for exit or building egress. Do not close or obstruct existing building fire exits.

3.2 DEMOLITION

A. Disconnect remove and / or cap designated utilities within demolition areas.

B. Demolish in an orderly and careful manner. Protect existing supporting structural members.

C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

E. Remove temporary Work.

F. Wherever a cutting torch or other equipment that may cause a fire is used, provide, and maintain fire extinguishers nearby ready for immediate use. All possible users shall be instructed in the use of the extinguishers.

G. Hydrants shall be accessible at all times. No debris shall be permitted to accumulate.

3.3 CLEAN UP

A. On completion of work of this section and after removal of all debris, site shall be left in drainable, clean condition satisfactory to Owner's Representative. Clean-up shall include disposal of all items and materials not required to be salvaged as well as all debris and rubbish resulting from demolition operations.

3.4 SCHEDULES

A. Refer to drawings for items called for to be demolished.

END OF SECTION

SECTION 03 01 30

FIBER REINFORCED POLYMER COMPOSITE SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This specification is intended to define the minimum requirements of structural strengthening using externally bonded fiber reinforced polymer (FRP) composite systems.

B. The work includes furnishing all materials, labor, equipment and services for the supply, installation and finish of all structural strengthening works using externally bonded FRP composite systems.

C. The general contractor or subcontractor shall furnish all materials, tools, equipment, transportation, necessary storage, access, labor and supervision required for the proper installation of the externally bonded FRP composite systems.

1.2 WORK INCLUDED

A. This Section of the Specification is not necessarily complete in itself. Read in conjunction with the Contract Documents.

1.2 REFERENCE STANDARDS

The publications listed below form a part of this specification to the extent referenced. Where a date is given for referenced standards, the edition of that date shall be used. Where no date is given for reference standards, the latest edition available on the date of the Notice of Invitation to Bid shall be used.

A. ICC AC125, Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber Reinforced Polymer (FRP) Composite Systems.
B. ICC AC178, Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber Reinforced Polymer (FRP) Composite Systems.
C. IAPMO EC 038, Evaluation Criteria for Diaphragm Strengthening using Fiber Reinforced Polymers.
D. ASTM D7565, Standard Test Method for Determining Tensile Properties of Fiber Reinforced Polymer Matrix Composites Used for Strengthening of Civil Structures.
E. ASTM D3039, Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials.
F. ASTM D7522, Standard Test Method for Pull-Off Strength for FRP Bonded to Concrete Substrate.

G. ACI 440.2R-17, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.
H. ICRI Technical Guideline No. 310.2R-2013 (formerly No. 03732), Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.4 MATERIAL QUALIFICATIONS

Materials for the FRP system have been pre-qualified and shall be as follows:

A. CSS V-Wrap FRP by Simpson Strong-tie, Inc. (5956 West Las Positas Boulevard, Pleasanton, CA. Tel: 925-560-9000, Fax: 925-847-1597)

B. Approved alternate FRP manufacturer. Alternate FRP systems must provide all items listed in Section 1.5 of this specification; otherwise, they shall be considered non-compliant.

1.5 SUBMITTALS

A. Quality Control and Quality Assurance:

1. Submit product data including the following:

a. Product standards, physical and chemical characteristics, technical specifications, limitations, installation instructions, maintenance instructions and general recommendations regarding each individual material.

2. Product installation manual including the following:

a. Instructions for storage, handling and installation of each component of the system.

b. Instructions for assembling FRP laminate samples for tensile testing as required by project specifications.

c. Quality control procedures to be conducted before, during, and after FRP installation.

3. The FRP Systems shall meet the requirements of ICC Evaluation Service Report (ESR 4930), compliant with 2021 International Building Code.

4. Submit a manufacturer approved testing laboratory that can perform ASTM D7565/D3039 tests as per Section 3.3 of this specification.

5. Submit a list of completed surface bonded FRP composite strengthening projects completed with the manufacturer's FRP composite system in the past 3 years. Include the dates of work, type, description and amount of work performed.

6. Submit a list of completed FRP strengthening projects designed by the licensed professional engineer utilizing the manufacturer’s FRP composite system.

7. Surface bonded FRP composite system shall be installed by certified applicators with written consent from the manufacturer that the contractor has been trained. The certified applicator shall have a minimum of three (3) years of experience in performing FRP composite retrofits.

B. Design and working drawings:
   1. Stamped and signed structural calculations and drawings by a professional Civil or Structural Engineer licensed in the state/province where the project site is located. Design shall be based on the written performance and/or design criteria provided on the structural drawings.

   2. Working drawings shall detail the type, locations, dimensions, anchorage, numbers of layers, and orientation of all FRP materials and coatings to be installed. Working drawings shall also show details, quantity, type, and location of FRP composite anchors.

C. Product Information:
   1. Provide an ICC and/or IAPMO Evaluation Service Report for the proposed products compliant with 2018 IBC, or later.

   2. Provide current IAPMO listing report for diaphragm strengthening.

   3. Provide test report for Class A Flame & Smoke Spread (IBC Section 803.1) per ASTM E84.

   4. Provide test report for tensile properties of the composite materials as determined based on 50 tests performed by independent laboratory in accordance with ASTM D7565/D3039 (tensile modulus, stress and strain).

   5. Properties of the fiber anchors (if used on the project) as determined by independent laboratory testing (tensile modulus, stress, and strain).

   6. Performance of composite anchors must be verified through testing for similar applications.

   7. Installation procedures, maintenance instructions, and general recommendations regarding each material to be used.

   8. Manufacturer's Safety Data Sheets (SDS) for all materials to be used.

   9. Manufacturer's product data sheet indicating physical, mechanical and chemical characteristics of all materials used in the FRP system.

   10. Written verification from the manufacturer that the FRP system applicator has received the required certifications and training.

11. Certification by the manufacturer that the supplied products comply with local regulations controlling use of volatile organic compounds (VOC's). Products that require the use of respirators do not comply with local regulations controlling the use of VOC's and shall not be allowed.

12. UL certification for fire protection system with the proposed FRP system. FRP strengthened elements shall have a listed fire resistance rating as follows:

    a. 4 hour rating for concrete beams and joists

    b. 3 hour rating for concrete floor slabs, roof slabs and columns

1.6 PERFORMANCE

A. Design the FRP composite system to achieve the structural performance shown on the structural drawings. Design calculations for the FRP composite system shall be submitted for approval by the engineer of record, and shall be stamped by a Civil or Structural Engineer registered in the state/province where the project site is located. The design of the FRP system shall be based on published design values from the manufacturer's ICC-ES or IAPMO-UES evaluation report consistent with long term durability exposure testing.

B. FRP design values must be lower than the calculated mean values determined from the test results received from the ASTM D7565/D3039 field test specimens (See Section 3.3 of this specification).

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver adhesive resin materials in factory-sealed containers with the manufacturer's labels intact and legible with verification of date of manufacture and shelf life.

B. Store materials in a protected area at a temperature between 45°F and 95°F.

C. Products shall be stored according to the manufacturer's requirements and shall avoid contact with soil and moisture. Products shall be stored to avoid UV exposure.

1.8 COORDINATION WITH OTHER TRADES

A. Prior to construction, the trades shall be briefed on any new or unusual construction procedures to ensure that they are aware of special conditions (e.g. new penetrations, construction anomalies).

\

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND COMPOSITE SYSTEMS

A. Approved CSS V-Wrap FRP to be supplied by Simpson Strong-Tie, Inc. (5956 West Las Positas Boulevard, Pleasanton, CA 94588. Tel: 925-560-9000, Fax: 925-847-1597) (ESR-4930) including:

1. Composite fabric:

CSS V-Wrap C100H/C200H/C400H high strength carbon fiber sheets.
CSS V-Wrap C100HM/C200HM/C400HM/C220B high modulus carbon fiber sheets.
CSS V-Wrap EG50/EG50B high strength glass fiber sheets.

2. Epoxy saturant/primer:
CSS V-Wrap 770 is a primer and is also combined with the fiber to form the CSS V-Wrap composite system.

3. Filler:
CSS V-Wrap PF putty filler or thickened CSS V-Wrap 770 is a protective seal coat and for filling voids.

B. CSS V-Wrap carbon fiber anchors shall be manufactured using the ICC-ES approved CSS V-Wrap products listed in ESR-4930.

C. The manufacturer shall provide specific information on physical, mechanical and chemical properties of fiber, adhesive resin and FRP composite, as required to meet project requirements.

2.2 CERTIFIED APPLICATORS

A. Installation of the CSS V-Wrap FRP shall be performed by certified applicators only. Certified applicators shall have the minimum experience and written consent by the FRP manufacturer

B. If requested, FRP contractor must provide a five (5) year bonded warranty by an “A” VIII rated surety (as defined by A.M. Best Co.) and licensed and admitted to provide surety bonds in the state/province where the project site is located for 10% of the contract amount.

2.3 OTHER MATERIALS

A. Contractor to provide compatible primer, filler and other materials recommended by the manufacturer as needed for the proper installation of the surface bonded FRP composite system.

PART 3 EXECUTION:

3.1 SURFACE PREPARATION

A. Contact critical applications: substrate must be smooth, clean and sound. Fill any uneven surfaces with the manufacturer's thickened epoxy.

B. Bond critical applications: substrate shall be prepared for bonding by means of abrasive blasting or grinding to remove existing laitance and expose aggregate [minimum ICRI CSP-3 concrete surface profile].

C. Round off sharp and chamfered corners (to be wrapped around) to a minimum radius of 0.5" by means of grinding or forming with the system's thickened epoxy or putty filler.

3.2 INSTALLATION

A. Preparation work for project: Visit site to ensure that all repair work is complete. Review project specifications in detail.

B. Verify ambient and concrete temperatures. No work shall proceed if the temperature of the concrete surface is less than 40°F or greater than 100°F or as specified on the epoxy component labels. The ambient temperature and temperature of the components shall be between 40°F and 100°F, unless provisions have been made to ensure components' temperature is maintained within this range or the range specified by the manufacturer.

C. Prepare the adhesive matrix by combining components at the weight (or volume) ratio specified by the manufacturer. The components of epoxy resin shall be mixed with a mechanical mixer until uniformly mixed, per manufacturer's recommended procedure.

D. Components that have exceeded their shelf life shall not be used.

E. The manufacturer shall clearly define the adhesive resin working time. Any batch of materials that exceeds the working time shall not be used.

F. FRP Fabric:

1. Saturation of the fabric shall be performed and monitored according to the manufacturer's specified fiber-adhesive resin ratio. Fabric shall be completely saturated prior to application to contact surface in order to ensure complete impregnation. Saturation shall be supervised and checked by the certified installer. Both the epoxy resin and fabric shall be measured accurately, combined, and applied uniformly at the rates shown on the approved working drawings and per manufacturer's recommendations.

2. Unless otherwise stated, all FRP fabric saturation shall be achieved using a saturator machine using the procedure outlined in the manufacturer's installation manual.

3. All cutting of fabrics, mixing of adhesive resin and combination thereof shall take place in a protected area away from any electrical equipment.

4. Remove dust and debris by hand or with compressed air as per specification.

5. Clean up and protect area adjacent to element where FRP composite is being applied.

6. Using a roller or trowel, apply one prime coat of epoxy resin to the substrate. Allow primer to become tacky to the touch.

7. Fill any uneven surfaces or recesses with thickened epoxy or putty filler.

8. Do not apply primer or thickened epoxy over a previously applied primer or putty that has fully cured (more than 72 hours after application), unless the surface has been scuff sanded and cleaned with solvent.

9. Apply saturated fabric to substrate surface by hand lay-up, using methods that produce intimate contact with the substrate. Verify proper orientation of the fabric per project drawings. A minimum lap length of at least 12" is required (unless otherwise specified on drawings) at all necessary overlaps in the primary fiber direction of the fabric.

10. Using a roller or hand pressure, release or roll out entrapped air, and ensure that each individual layer is firmly adhered to the preceding layer or substrate.

11. Apply subsequent layers, continuously or spliced, until the total number of layers specified on project drawings is achieved.

12. Do not apply additional layers of fabric to previously cured plies unless the applied laminate surface is first scuff sanded (without damaging the fibers) and cleaned with solvent.

13. Finish: Detail all fabric edges, including termination points and edges, with thickened epoxy or putty filler, as directed by the manufacturer. Finish as specified between 24 and 72 hours after final application of epoxy. If after 72 hours the adhesive is cured, the surface must be roughened by hand sanding or brush blasting followed by cleaning with solvent, prior to finishing.

14. System may incorporate structural fasteners but limitations and detailing must be verified with composite system manufacturer.

15. When metal penetrations are made through carbon FRP or metal is to be placed against carbon FRP, provide dielectric barrier details to prevent potential galvanic corrosion.

G. FRP Anchors:

1. Verify layout and depth of existing reinforcing steel reinforcement prior to drilling holes. Do not damage/cut existing steel reinforcement.

2. Drill holes using a rotary drill. Detail the penetration using a larger bit to tap outside of hole and create tapered opening at the surface of the substrate. Hole diameter should be 1/8 in. greater than the anchor diameter.

3. Use compressed air to blow out drilled holes. Blow from the back of the hole to remove dust created from drilling procedure.

4. Clean hole surfaces with wire brush, insert brush to back of the hole in twisting motion then remove it.

5. Blow out drilled holes again to remove dust created from wire brush cleaning.

6. Apply one prime coat of CSS V-Wrap 770 epoxy resin to holes, and to the surface of the adjacent FRP sheet receiving the anchor splay.

7. Saturate the FRP anchor with epoxy resin. Saturation of the anchors shall be monitored by a certified installer.

8. Insert FRP anchor into drilled holes.

9. Spread fiber at splay end onto the adjacent fabric surface in a triangular pattern as specified on project drawings.

10. Apply a coat of thickened CSS V-Wrap 770 epoxy or CSS V-Wrap PF putty filler to smooth over FRP anchor splay.

3.3 INSPECTION AND TESTING

A. Field Inspection

1. The contractor shall monitor the mixing of all adhesive components for proper ratio and adherence to manufacturer's recommendations. Record lot/batch numbers for fabric and epoxy used each day and note locations of installation. Measure square footage of fabric and volume of epoxy used each day. Complete report and submit to engineer and FRP composite system manufacturer.

2. A Certified Special Inspector shall periodically observe all aspects of preparation, mixing, and application. All FRP composite applied areas shall be inspected, in accordance with the manufacturer's specifications for voids, bubbles, and delamination. All defective areas shall be repaired as specified in Section 3.4 "Required Remediation".

3. The Engineer may suspend the work if the Contractor substitutes an unapproved fiber reinforced composite system or unapproved personnel during construction.

B. In-situ Testing: Adhesion Tests - ASTM D7522 and/or ASTM D4541

a. Direct tension adhesion testing are not required for contact-critical applications.

b. Direct tension adhesion testing of cored samples shall be conducted using the method described by ASTM D7522. A minimum of three tests shall be performed for each day of production or for each 1,000 ft² (93 m²) of FRP application, whichever is less. Tests shall be performed for each surface preparation technique used.

c. The prepared surface of the bonded FRP system shall be allowed to cure a minimum of 72 hours before execution of the direct tension pull-off test. The locations of the pull-off tests shall be representative adjacent locations to the area being strengthened and on flat surfaces. If no adjacent areas exist, the tests shall be conducted on areas of the FRP system subjected to relatively low stress during service.

d. Criteria for determining adequate bond strength:

a. The minimum acceptable value for any single tension test is 200 psi.

b. Failure occurs in the substrate (mode G in ASTM D7522).

If either of the two requirements above is not met, the Engineer must be notified. The Engineer may request additional tests to be performed to qualify the work, or may consider the following as acceptable:

c. A bond strength less than 200 psi with failure in the substrate.

d. A bond strength greater than 500 psi with failure not in the substrate.

e. Test locations shall be filled with thickened adhesive after the values have been recorded and verified by the special inspector and the test dollies have been removed.

C. FRP Anchor Quality Control

1. Anchor Saturation: Select five saturated anchors of each diameter for visual inspection. Fully open fibers to observe complete saturation.

2. Visual Inspection: Visual inspect installed FRP anchors to verify spacing, splay length, and splay width. Acceptable tolerances will vary depending on project scope, and anchor type and dimensions. Consult project EOR and FRP manufacturer on acceptable tolerances for the project.

3. FRP Anchor Pull-out Testing where required on Contract Documents only: Two epoxy embedded anchors for each anchor diameter and each embedment depth used on the project shall be tested to verify anchor installation.

a. Manufacturer will work with the installer and the inspector to prepare the FRP anchors for field testing. Preparation includes tabbing the splay of the anchors and curing the anchors.
b. Anchor test locations shall be chosen to represent the specified application.
c. Tested anchors will be abandoned after testing and shall not be at the same location of the anchors required for strengthening.
d. Test locations shall be coordinated with the FRP designer and the FRP manufacturer to minimize damage to existing element or structure.
e. Tests shall be performed using standard adhesive anchor hydraulic tension testing equipment.
f. The test load shall be 80 percent of the anchor design load as provided by the FRP manufacturer. The test load shall be maintained for a minimum of 15 seconds with no discernable movement.
g. After the test is complete, the anchor shall be cut off and the embedded portion of the anchor shall be abandoned.

D. Laboratory Testing
1. Sampling
a. Labeling of test samples shall include the following: project name, fabric type, resin type, lot number of fabric and batch numbers of epoxy resin components used, date of sample fabrication, location of installation, and name of the certified installer that prepared the sample.
b. A "sample batch" shall consist of two 12" by 12" samples of cured composite. One panel shall be made for every 5,000 ft^2 of material installed with a minimum of one "sample batch" per daily. The two "sample batches" will be taken at appropriate times during the day as to ensure the maximum material deviance in the components of the FRP composite.
2. Preparation of Samples
a. Prepare sample on a smooth, flat, level surface covered with polyethylene sheeting, or 16 mil plastic film, and secure the edges.
b. Apply a coat of adhesive resin with roller or brush to plastic surface.
c. Place one layer of saturated fabric into the resin. Fabric piece must be minimum 12" x 12". Ensure that fibers are straight and do not contain waves.
d. Overcoat fabric layer with additional resin. Lightly rib roll FRP laminate to remove air and impregnate fibers (rib roll only along the direction of the fibers). Work from middle of laminate towards the end, or from one end to the other end.
e. Place a second sheet of plastic film over the entire area.
f. Using a flat paddle or putty knife, squeegee out excess resin by applying pressure on the straight blade and moving the blade in the fiber direction.
g. Starting in the middle and working in the direction of the fiber, pull putty knife towards the ends. Air should be seen in front of the blade, and excess resin will collect in the area around the test sample. Panels should be made as thin as possible. Extra effort should be made to remove any excess resin.

h. Turn the panel over gently and repeat the process on the other side. Make sure that all air bubbles have been squeegeed out of the panel.
i. Samples shall be stored on a hard flat surface and not moved for a minimum 48 hours after casting. The prepared and labeled samples shall be given to a pre-approved and experienced testing laboratory. The laboratory shall then precondition samples for 48 hours at 140°F before testing.
j. If the panel is warped or misalignment of fibers is observed, discard panel and fabricate new one. Do not ship defective panel.

E. ASTM D7565/D3039 – Tension Tests

1. Testing specimens shall be cut from samples and tested for ultimate tensile strength, tensile modulus and percentage elongation as per ASTM D7565/D3039 in the longitudinal fiber direction.
2. A minimum of three samples should be tested for each type of fiber and for each lot of fiber used. If one coupon fails for a sample, additional test coupon from the same 12" x 12" sample should be tested. If these specimens also fail, the other 12" x 12" sample from the same "sample batch" should be tested.
3. Testing results shall be made available within 3 weeks of sample submission.

F. Acceptance Criteria

1. Acceptable mean values for ultimate tensile strength, tensile modulus, and elongation determined per ASTM D7565/D3039 for field prepared specimens shall not be below the submitted FRP design values.
2. Mean test values below the submitted design values are considered a failure and require remediation
3. If FRP material properties are considered as potentially deficient, calculations prepared by the licensed Engineer responsible for the FRP design demonstrating that the portion of the structure strengthened with the potentially deficient material possesses adequate design capacity, can be submitted for approval. Alternately, additional layers shall be installed until the composite thickness is increased by the same percentage as the deficiency of the material's tensile modulus, or any other remediation as directed by the licensed engineer.

3.4 REQUIRED REMEDIATION

A. Small delaminations 2 in^2 of less are acceptable as long as the delaminated area is less than 5% of the total laminate area and there are no more than 10 such delaminations per 10 ft^2.

B. Voids and bubbles larger than 2 in^2 and less than 25 in^2 shall be injected or back-filled with epoxy.

C. Voids and delaminations on the order of 6" in diameter or an area of 5" x 5" shall be reported to the engineer of record and remediation shall be submitted by the contractor for approval.

3.5 CLEAN-UP

A. Make good at no cost to the Owner, for any damage to the new or existing structures, property or services caused by the installation and testing of the FRP composite.

B. Remove all surplus material, equipment and debris from the site on completion of the work. Leave the site clean.

END OF SECTION

SECTION 03 11 00

CONCRETE FORM WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All concrete and related items required to complete the building, provide off-sets, bulkheads, recesses, openings, chases, etc., and install any inserts, sleeves, etc., required by other trades.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Concrete: Section 03 30 00

B. Concrete Reinforcement: Section 03 21 00

1.3 WORK INSTALLED BUT FURNISHED BY OTHER SECTIONS:

A. Built-in anchors, inserts and bolts for connection of other materials.

B. Built-in sleeves, thimbles, dovetail slots, and water-stops.

1.4 DEFINITIONS:

A. Architectural Concrete Surfaces: Formed surfaces where appearance is of major importance.

B. Non-Architectural Concrete Surfaces: Formed surfaces where appearance is not of major importance.

1.5 QUALITY ASSURANCE:

A. Design Criteria:
   1. General: Conform to ACI 347-Current Edition Chapter 1, Design.
   2. Plywood: Conform to tables for form design in APA Form V 345- Current Edition, including strength.

B. Requirements of Regulatory Agencies: Erect forms to meet the requirements of the Local Building Code.

C. Allowable Tolerances:
   1. Non-Architectural Concrete: Conform to ACI 347- Current Edition.

D. Contractor shall assume full responsibility for earthwork, or an existing structure used as a form and such form work must meet all requirements of this section.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. On delivery to the job site, place materials in area protected from weather.

B. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

C. Handle materials to prevent damage.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Conform to ACI 347- Current Edition, Chapter 3, Materials and Form Work.

2.2 LUMBER:

A. Softwood framing lumber: Kiln dried, PS 20-70.

B. Boards less than 1 1/2" thick, used for basic forms and form liners: Kiln dried.

C. Grade marked by grading rules agency approved by American Lumber Standards Committee.

D. Light framing or studs for plywood forms, 2 in. to 4 inches in width and thickness, construction grade.

2.3 PLYWOOD:

A. Exterior type softwood plywood, PS 1-66.

B. Each panel stamped or branded indicating veneer grades, species, type and identification.

C. Wood faced plywood for architectural concrete surfaces. Panel veneer grades: A-C. Mill-oiled sides and mill-sealed edges of panels.

2.4 CORNER FORMERS:

A. Profile type: chamfered face.

B. Material: Wood

2.5 TIES:

A. Material: Carbon Steel

B. Type: Snap ties

C. Depth of break back: 1 inch

D. Maximum diameter: 1/4 inch

2.6 FORM COATINGS:

A. Plywood and wood forms shall be sealed against absorption of moisture from the concrete with an approved non-staining form oil or sealer.

B. Form sealer, lacquer or any form of release agents containing wax, oil, or other materials that would interfere with adhesion shall not be used on form work for concrete which is to receive exposed aggregate coatings.

PART 3 EXECUTION:

3.1 GENERAL

A. The design, engineering, bracing and construction of form work shall be the responsibility of the Contractor.

B. Form work shall conform to shapes, lines and dimensions of members as shown on contract plans and shall be sufficient to prevent mortar leakage and to maintain position and shape during and after placing of concrete. Form work for exposed surfaces shall be constructed of undamaged materials that will result in an unblemished, flush surface when removed.

C. Shoring and bracing of form work shall be adequate to resist all construction loads, wet concrete, stored and lateral loads due to earthwork.

D. Preparation of forms. Edges of exposed concrete work, exterior and interior shall be pointed up to present a good square appearance.

E. Provide temporary openings in framework for concrete placement.

F. Removal of forms is subject to weather conditions after concrete is poured. Remove formwork in manner to ensure complete safety of structure. Do not place building materials on slabs until they are strong enough to carry the imposed load. The contractor shall decide when to remove and accept full responsibility for their removal.

G. Do not run reinforcement, corner protection angles, or related fixed metal items, embedded in or bonded into concrete through expansion joints. Provide filler strips for expansion joints between slabs on grade and all joints between slabs on grade and vertical surfaces. Construct joints ½ inch wide and full depth of slab unless noted otherwise.

END OF SECTION

SECTION 03 21 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 Section Includes:

A. All steel reinforcement, mesh, dowels, and related items to comply with drawings and specifications including materials, labor, and equipment to complete the building and work shown.

B. Observation and Required Special Inspections

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 40 00 – Quality Control: Required Special Inspections
B. Section 03 11 00 - Concrete Form Work
C. Section 03 30 00 - Cast-In-Place Concrete
D. Section 04 22 00 - Concrete Unit Masonry

1.3 QUALITY ASSURANCE:

A. Acceptable Manufacturers: Regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.

B. Installer Qualifications:
   1. Three years experience in installation of steel bar and welded wire fabric reinforcing.

C. Requirements of Regulatory Agencies: Conform to requirements of local Building Code.

D. Allowable Tolerances:
   1. Fabrication:
      a. Sheared length: + or - 1 inch
      b. Stirrups, ties and spirals: + or - 1/2 inch
      c. All other bends: + or - 1 inch
   2. Placement:
      a. Concrete cover to form surfaces: + or - 1/4 inch
      b. Minimum spacing between bars: + or - 1/4 inch
      c. Top bars in slabs:
         (1) Members 8 inches deep or less: + or - 1/4 inch

      d. Crosswise of members: Spaced evenly within 2 inches of stated separation.
      e. Lengthwise of members: + or - 2 inches.
   3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.

1.4 SHOP DRAWINGS:

A. Comply with Section 01 33 00.

B. Show sizes and dimensions for fabrications and placing of reinforcing steel and bar supports.

C. Indicate bar schedule, stirrup spacing, and diagrams of bend bars.

D. All detailing, fabrication and erection of reinforcing bars shall comply with the A.C.I. Manual of Standard Practice for Detailing Reinforced Concrete Structures. (A.C.I. 315). ACI 315R- 18 is titled “Guide to Presenting Reinforcing Steel Design Details.”

E. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver reinforcement to project site in bundles marked with durable tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

PART 2 PRODUCTS

2.1 MATERIALS

A. REINFORCING STEEL. Reinforcing steel for concrete shall be deformed, clean, free from rust and new. It shall conform to ASTM Standard A 615 and shall be Grade 60 for bars No. 4 and larger and Grade 40 for No. 3 bars and smaller.

B. SMOOTH STEEL DOWEL BARS. Plain steel dowel bars for reinforcing concrete slab joints shall meet the requirements of ASTM A 615, Grade 60. These plain round dowel bars shall be free from burrs or other deformations restricting slippage in the concrete.
   1. Smooth Dowel bars shall be held in position parallel to the surface and centerline of the slab by a metal assembly of sufficient strength and anchorage to prevent displacement during the paving operations. Immediately prior to placement of concrete, each bar shall be field coated for a minimum distance of 2 inches greater than half the length of the bar with an approved lubricant. Lubricated ends of adjacent bars shall be on alternating sides of the slab joint.

C. WIRE FABRIC. Wire fabric shall be electrically-welded wire fabric of cold-drawn wire (70,000 psi yield point) of the diameter and spacing required and shall conform to ASTM Standard A 185. Welded wire fabric or mesh shall be of gauge and mesh shown on plans and shall conform to "Standard Specifications for Welded Steel Wire Fabric for Concrete REINFORCEMENT: (ASTM A1064-Current Edition). Furnish mesh in flat sheets.

ASTM A1064/A1064M – 17 is titled “Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.”

D. TIE WIRE: FS-QQ-W-461, annealed steel, black, 16 gauge minimum

E. BAR & WIRE MESH SUPPORTS: Conform to "Bar Support Specifications", CRSI Manual of Standard Practice. Metal bolsters required. No bricks or CMU allowed. Bars supports used over or against concrete surfaces which are exposed shall be plastic protected. The plastic shall have a thickness of 3/32" or greater at points of contact with the form work. The plastic shall extend upward on the wire to a point at least 1/2" above the form work. Provide following support types (CRSI Designation):
   1. Woven Wire Mesh: Type “SBU”, linear, longest length possible.
   2. Steel reinforcement bars: Type “SBU”, length as required to fit in trench and properly support bars.
   3. Note: “SBU” type supports to have two (2) bottom runners and one (1) top runner, all continuous.

PART 3 EXECUTION

3.1 FABRICATION

A. In accord with CRSI Manual of Standard Practice.

3.2 INSTALLATION:

A. Placements:
   1. Bar Supports: CRSI Placing Reinforcing Bars (10th Edition)
   2. Reinforcing Bars: CRSI Supports for Reinforcement Used in Concrete (2016). Support footing reinforcement bars with SBU type supports. Space at no more than 4’-0” on center. Support reinforcement bars at each footing corner and intersection. **Rebar chairs will not be acceptable.** For large double layer reinforcement pad footing mats, provide doubling of the SBU supports. Concrete bricks may be used as an option at large double-matted footings, **but only upon Architect’s approval**.
   3. Details shall be in accordance with "Building Code Requirements for Structural Concrete" (ACI 318-Current Edition)
   4. **Place sufficient length supports for wire mesh concrete slab reinforcement no more than 3’-0” on center, or stagger at 2’-0” on center. Do not cut supports into small lengths.** Do not extend support through control joints.
   5. Install #4 reinforcement hoops around slab penetrations 3” or larger in diameter. This would include, but not be limited to plumbing pipes, electrical conduit, floor drains, electrical floor boxes, etc.
   6. Where groups of electrical conduits exceed 3” in diameter, install #4 reinforcement hoops around groups, or provide straight #4 bars around linear groups.

B. Steel Adjustment:
   1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.

2. Do not move bars beyond allowable tolerances without concurrence of Architect/Engineer.
3. Do not heat, bend, or cut bars without concurrence of Architect/Engineer.

C. Concrete covering over reinforcement shall be not less than the following:
1. Where concrete is deposited directly against earth: 3"
2. Where formed concrete surface will be exposed to weather or ground: 2"
3. Where formed concrete surface will not be exposed to weather or ground: for walls and slabs: As stated in structural drawings
4. All covering: Nominal bar diameter

D. Splices:
1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
2. Splice devices: Install in accordance with manufacturer's written instructions.
3. Welding: Do not weld reinforcement.
4. Do not splice bars except at locations shown on drawings without concurrence of Architect/Engineer.

E. Wire Fabric:
1. Install in longest practicable length.
2. Lap adjoining pieces one full mesh minimum, and lace splices with 16-gauge wire.
3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
4. Offset end laps in adjacent widths to prevent continuous laps.
5. Do not continue wire fabric through control joints

3.3 CLEANING:

A. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

3.4 . PROTECTION DURING CONCRETING:
A. Keep reinforcing steel in proper position during concrete placement.

3.5 OBSERVATION AND SPECIAL INSPECTIONS
A. Reinforcement and placement shall be observed by the Architect/Engineer prior to placing concrete. Inspection of reinforcement for conformance to the construction documents shall be completed by the designated third-party Special Inspector.

3.6 INSTALLATION OF MISCELLANEOUS ITEMS:

A. Contractor shall coordinate and check that all work required to be embedded in concrete is in place prior to pouring. Placement of such work is to be done without disturbing reinforcement in place.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE:

A. This Contractor shall furnish all material and labor necessary to complete execution of all concrete portions of this project, including the following items and other items of concrete or cement work which may be essential to complete that portion of the work as shown on the contract drawings and as hereinafter specified.
   1. Footings, foundations and structural members as shown, including piers if required.
   2. Concrete finish floor slabs.
   3. All concrete landings, walks, curbs, etc.
   4. Interior trenching in existing concrete floors.
   5. Non-Shrink and Epoxy Grout
   6. Concrete Accessories
   7. Concrete Floor Densifier/Hardener
   8. Clear Sealer (Water and Oil Repellent)
   9. Micro-Fiber Concrete Admixture
   10. Concrete Minimum Finish Tolerances & Standards
   11. Concrete Slab Moisture Mitigation
   12. Observation and Required Special Inspections
   12. Concrete Mix Design Submittal Form

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 40 00 – Quality Control: Required Special Inspections
B. Section 03 11 00 - Concrete Form Work
C. Section 03 21 00 - Concrete Reinforcement
D. Section 04 22 00 Concrete Unit Masonry
E. Section 31 23 00 - Structural Excavation, Backfill and Compaction
F. Section 32 16 00 - Walks and Curbs

1.3 QUALITY ASSURANCE:

A. Standards: Provisions of American Concrete Institute "Building Code Requirements for Structural Concrete" (ACI 318-Current Edition). American Concrete Institute "Specifications for Structural Concrete" (ACI 301-Current Edition), Concrete Reinforcing Steel Institute "Manual of Standard Practice" (Current Edition), American Concrete Institute "Guide to Presenting Reinforcing Steel Design Details" (ACI 315-Current Edition) and " Guide to Formwork for Concrete" (ACI 347-Current Edition) are adopted except that where additional or more stringent requirements are required by these specifications.

B. Tests: As listed in Standard Practice for Sampling Freshly Mixed Concrete ASTM C 172-Current Edition.

C. Control Joints and Expansion Joints: Follow Provisions of American Concrete Institute concerning maximum area for placement of expansion and control joints unless shown or noted otherwise on drawings and specifications. If contractor requests adjustments to control joint placement or additional control joints and/or expansion joints, consult Architect prior to concrete placement.

D. **Slabs must be replaced that have a crack(s) with a width of 0.05" or greater. In high visibility areas all cracks in slabs will be subject to replacement of slab sections at the discretion of the Architect.**

1.4 SUBMITTALS:

A. Test Reports: Reports of concrete compression, yield, and slump tests.

B. Certificates:
   1. Manufacturer's certification that materials meet specification requirements.
   2. Material content per cubic yard of each class of concrete furnished:
      a. Dry weights of cement.
      b. Saturated surface-dried weights of fine and coarse aggregate.
      c. Quantities, type and name of admixtures.
      d. Weight of water.
   3. Ready-mix delivery tickets, ASTM C 94-Current Edition.

C. Fully completed concrete mix design submittal form found at the end of this section for each type of concrete to be placed.

1.5 PRODUCT AND ENGINEERING DATA:

A. Submit data for design mixes, proposed admixtures, etc. per Section 01 33 00.

B. The Contractor shall be responsible for checking quantities and dimensions in accordance with contract drawings and field conditions. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions noted on submittal drawings.

C. Contract drawings receive precedence over shop drawings unless authorized in writing.

D. Shop drawings furnished for reinforcing steel shall contain fabrication details as well as placement drawings which are to be used in conjunction with contract drawings.

E. Detailing and fabrication of reinforcing shall conform to " Guide to Presenting Reinforcing Steel Design Details", (ACI 315-Current Edition).

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Cement: Store in weather tight enclosures and protect against dampness, contamination, and warehouse set. Any cement damaged by moisture, or which fails to meet any of the specified requirements shall be rejected and removed from the work.

B. Aggregates:
   1. Stockpile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
   2. Use only one supply source for each aggregate stockpile.

C. Mixing: Ready-mixed concrete shall be mixed and delivered in accordance with Standard Specifications for Ready-Mixed Concrete" (ASTM C94-Current Edition).

1.7 ENVIRONMENTAL REQUIREMENTS:

A. Allowable Concrete Temperatures
   1. Cold Weather: Minimum 40 degrees. With temperatures lower than 40 degrees, approval by the Architect shall be required.
   2. Hot Weather: Maximum 90 degrees F.

B. Do not place concrete during rain, sleet, or snow unless protection is provided which is approved by Architect.

1.8 CERTIFICATION

A. Ready Mix concrete batch plant to be NRMCA (National Ready Mixed Concrete Association) certified. Submit proof of certification with submittals.

B. Concrete Flatwork Finishers to be ACI certified. Submit proof of certification to the Architect for approval.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete:
   1. Portland Cement: Type 1 Portland, meeting "Standard Specifications for Portland Cement", (ASTM C150-Current Edition) shall be used.
   2. Aggregates: All aggregates shall be limestone, clean, hard strong and durable particles free of chemicals or foreign material that may affect the bonding of cement paste and shall conform to "Specifications for Concrete Aggregates" (ASTM C33-Current Edition). Coarse aggregate gradation shall be within the limits of 1 inch to No. 4 standard sieve analysis. Alternate aggregate materials must be reviewed and approved by the architect.
   3. Mixing Water: Water shall be fresh, clean, and potable.
   4. Slump: 5 inch maximum: plus, tolerance O inches, minus tolerance 2 inches.

5. Mix proportioning: To produce 28-day minimum compressive strength of moist cured laboratory samples. Provide the following minimum compressive strengths at listed locations unless noted otherwise in other specification sections or on drawings:
   a. 3000 psi for all footing and foundation stem walls.
   b. 3500 psi for all exterior sidewalk/stoop/patio locations.
   c. 3,500 psi for all sidewalks and curb and gutter
   d. 4,000 psi for all concrete paving
   e. 3500 psi for all interior slabs-on-grade.
   f. 3000 psi for all other concrete items

B. Curing Material: Products and material as required to apply and maintain slab in moist condition during curing period per this specification. Constant water sprinkling or water curing covers kept wet are acceptable only if precautions are taken to protect existing slabs from flooding.
   1. Curing Material: Chemical curing products: AmeriPolish PCA curing agent, manufactured by AmeriPolish Architectural Concrete Products, (800) 592-9320. 1100-CLEAR, manufacturerd by W.R. Meadows Inc, (800)342-5976. L&M CURE, manufactured by Laticrete (800)243-4788.
   2. Do not use polyethylene vapor barrier or similar membrane for curing membranes when water curing in areas where exposed concrete finish is scheduled.

C. Below-slab vapor barrier shall be as specified in Section 07 10 00, but no less than 15 mils thick.

D. Reinforcement: See Section 03 21 00

2.2 CONCRETE FLOOR DENSIFIER/HARDENER AND SEALER

A. Penetrating Hardener/Densifier: (Clear liquid reactive lithium-silicate based.)
   1. Retroplate 99 by Advanced Floor Products.
   2. Consolideck LS, by Prosoco.
   3. 3D HS, by Ameripolish
   4. Approved alternate by other manufacturer specified herein.

B. Clear Sealer: Refer to specification 09 91 00 Paint & Finishing

2.3 MIXES:

A. Proportions: Ready-mix concrete shall meet "Specifications for Ready-Mixed Concrete" (ASTM C94-94). Proportions of concrete shall produce the required strength and be workable to the extent that it can be worked into the corners and angles of forms and around reinforcement. Collection of excess free water on the surface will not be permitted nor a segregation of the materials in the mixture.

B. Free surface moisture on aggregates shall be included as part of the mixing water.

C. Water-cement ratios for project concrete mix shall be such that the relationship between the required strength and water-cement ratio of ingredients used has been previously established by reliable tests and data. Copies of previous test data, along with design mix data shall be submitted to the Architect by the Contractor for approval. Where such data is not available or is insufficient, water-cement ratios shall meet the requirements of Table 4.2.2 of ACI 318-Current Edition. Cementitious content shall be the total weight of all Portland cement and fly ash in a given mix.

D. Admixtures shall comply with the ASTM Specifications for Chemical Admixtures. (ASTM C494-Current Edition).
   1. Mid-Range Water Reducing Admixture: Mira 110, manufactured by Grace Concrete Products, 877-423-6491, Master Builders Polyheed 1720, manufactured by BASF or approved alternate product. Non-chloride, non-corrosive. Admixture to meet ASTM C494 Type A & F requirements. Comply with manufacturer's instructions for dosage. Admixture to be incorporated with mix at batch plant.
      a. other admixtures may be used as a concrete mix component only with approval of the Architect.
      b. Use all admixtures in accordance with recommendations of the manufacturer.

   2. For concrete containing HRWR admixture (super- plasticizer) when approved by Architect: slump shall be 6"-8".

   3. In no case shall the use of the admixtures produce a compressive strength less than that specified in this section.

   4. Fly ash (Type C or F per ASTM C618) may be used as an admixture in concrete which is not exposed to view and does not require surface finish. Use of only one type of fly ash throughout the project shall be permitted. Such areas are limited to footings, below grade foundation walls, filled masonry voids, etc. The use of fly ash as an admixture **shall not be permitted** in concrete where surface finish is required. Such areas as floor slabs, exposed concrete walls, exposed concrete structure, etc., shall not be poured with concrete containing fly. Other admixtures may be used only with the approval of the Architect. Each delivery record shall indicate mix design. Concrete will be subject to rejection if mix design is not called out on invoice at time of delivery.

   5. All concrete installed at the exterior on a permanent basis shall be air entrained. Interior slabs shall not contain air entrainment. If admixture is desired, obtain approval through Architect.

   6. Air-entraining admixture if used, shall meet "Specifications for Air-Entraining Admixtures" (ASTM C260-Current Edition) and shall produce air content by volume between 5 to 7%.

F. Use same Portland cement manufacturer throughout project for all interior concrete. Portland cement manufacturer may be different for exterior concrete but must be the same Portland cement manufacturer for all exterior concrete.

2.4 NON-SHRINK AND EPOXY GROUT

A. Non-Shrink Grout, Non-Metallic Grout: Factory premixed grout conforming to CRD-C-621-80, “Corps of Engineers Specification for Non-Shrink Grout”.
   1. Acceptable Manufacturers:
      a. EUCO NS, the Euclid Chemical Company
      b. Sonogrout, Sonneborn-Contech
      c. Masterflow 713, Master Builders
      d. Duragrout, L & M Construction Chemical Co.

B. Epoxy Grout: Structural epoxy adhesive conforming to ASTM C881.
   1. Acceptable Manufacturers:
      a. Sikadur 32 Hi-Mod by Sika Corporation
      b. Sonneborn Epogel by Chemrex, Inc.
      c. Epcon C6 by ITW Ramset/Redhead
      d. Hilti HY-200

2.5 ACCESSORIES

A. Pre-cast Concrete Wheel Stops: Furnish and install, as shown on the drawings, a pre-cast concrete wheel stop at each designated parking space where no cast-in-place curb or turn-down sidewalk occurs. Anchor units as shown on drawings.

B. Furnish concrete splash block at each downspout approximately 12" wide x 24" long. Slope from back to front for proper drainage.

PART 3 EXECUTION

3.1 OBSERVATIONS AND SPECIAL INSPECTIONS

A. All reinforced concrete construction shall be performed under the personal supervision of the Building Superintendent. This superintendent shall keep a record of all concrete poured on the job. The record shall show in detail the area placed, the time and date of the placement and weather conditions which existed at the time of the placement. Upon completion of the work, this record of Concrete Placement shall be included in the close out documents.

B. The Contractor shall plan his work so that adequate time is allowed for the Architect to properly observe all embedded work prior to actual placement of concrete. The Contractor shall notify the Architect of his intent to placement at least 24 hours prior to the time that he estimates the work will be ready for observation. The Contractor shall not place any reinforced concrete without the approval of the Architect.

C. Contractor shall plan work and coordinate with independent testing lab to be present on-site throughout concrete placement.

D. Inspection of concrete and concrete preparation for conformance to the construction documents and IBC shall be completed by the designated third-party Special Inspector.

3.2 INSTALLATION:

A. Placing Concrete:
   1. Convey concrete from mixer to final position by method which will prevent separation or loss of material.

   2. Maximum time permitted before a placement of concrete after adding mixture water shall be as follows:
      a. Air temperature above 78 degrees F. - 60 minutes.
      b. Air temperature below 78 degrees F. - 90 minutes.

   3. Concrete shall not be placed until an observation by the Architect has been made and reinforcement placement, vapor barrier, etc., is approved.

   4. Excavations for footing shall be free of debris, loose dirt, mud and water just prior to placing of concrete.

   5. All forms shall be clean of debris and all embedded items shall be in place and secured prior to concrete placement.

   6. Wood forms shall be sprinkled with water and wet when concrete is placed, but pooling of water in forms is to be prevented.

   7. Maximum height of concrete free fall, 3 feet.

   8. Regulate rate of placement so concrete remains plastic and flows into position.

   9. Deposit concrete in continuous operation until panel or section is completed.

   10. **Concrete Placement Tolerances & Standards**:
      a. Submit proposed slab pouring plan for review and approval by Architect prior to forming. For purposes of planning layout, approximately 5,000 to 7,000 sq.ft.is the maximum area allowed. Pending crew size and equipment larger square foot pour areas may be allowed by Architect.
      b. **Control joints:** Saw cuts are to be performed within 12 hours after finishing. Use 1/8" thick blade, cutting no less than **1/3** of the slab thickness, unless noted otherwise.
      c. Place control joints for concrete slabs (slab–on-grade) no more than 14’-0” o.c. each way.
         i. For other concrete slab thicknesses, refer to structural drawings for control joint spacing.
      d. Note: Other placement methods may be considered only with approval of Architect.

11. Concrete Slab Levelness and Flatness:
    a. Levelness: FL=20
    b. Flatness: FF = 25
    c. In areas with floor drains, maintain finished floor level elevation at walls and slope surfaces uniformly to drains.

12. Place concrete in horizontal layers, 18 inches maximum thickness.

13. For concrete on grade or fill, sub-grades shall be properly prepared and maintained as specified previously. Where concrete is placed in direct contact with the earth, the subgrade material shall be wet but not muddy at time of placement.

14. Under all slabs, provide crushed stone choked off with fines per specification Section 31 23 00, meeting ASTM C33-Current Edition, which shall be leveled and compacted. A vapor barrier, as specified in Section 07 10 00 and shown on the drawings shall be placed under all interior slabs-on-grade.
15. Removal of forms. Do not remove forms until concrete has hardened sufficiently to support its own weight and imposed construction loads. Remove forms in such manner as to ensure the complete safety of the structure and to prevent spalling or chipping of concrete. When removing forms, conform to the following:
    a. Non-Weight Supporting Forms: Form work for columns, walls, sides of beams and other parts not supporting the weight of the concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations, but in no case sooner than 24 hours.
    b. Weight Supporting Forms: Do not remove form work for beam soffits, supported slabs or other parts which support the weight of concrete until concrete has reached 75% of its specified 28-day strength based on the lab cured concrete cylinder tests, but no sooner than 7 days.

16. Wall tie treatment. Wall ties shall be broken off after forms are removed and sealed against water penetration.

17. Slope all concrete floors to trench, or floor drains from corners of room, or as shown on drawings. Provide total slope of 1/2", unless noted otherwise on drawings.

18. Follow procedures as listed below for placement and routing of pipes, sleeves, and electrical conduit:
    (If any of these items are not met, pouring of concrete will not be allowed until corrected.)
        a. **Do not** route groups of conduit, pipes or sleeves above footings, unless noted to do so. If conflict occurs, consult Architect/Engineer.
        b. **Do not** route conduit, pipes, and sleeves below bearing walls when running parallel with wall.
        c. Limit width of conduit, pipes and sleeves not to exceed 3’-0” in width as it passes under wall footing. As much as possible, align the items perpendicular to the footing as it passes below footing.

d. Provide a minimum spacing of 2'-0" between conduit or pipe groups as items pass under footings.
e. **Do not** route conduits, pipe or sleeves under or through column footings or pad footings unless prior approval is given by Architect/Engineer.
f. The top of all conduits, sanitary drain pipe, water supply pipe, etc. shall be installed at or below bottom of concrete slab where slab is on grade.
g. Where in-slab electrical floor boxes occur, the conduit shall slope down to below-slab elevation as soon as possible on exterior sides of floor box.

B. Consolidating Concrete at Steel Reinforcement:
1. Use mechanical vibrating equipment for consolidation.
2. Vertically insert and remove hand-held vibrators having minimum 1" diameter at points 18 inches to 30 inches apart.
3. Do not use vibrators to transport concrete in forms.
4. Minimum vibrator speed, 3600 rpm.
5. Vibrate concrete minimum amount required for consolidation, 3 to 5 seconds maximum.

C. Construction Joints:
1. Clean and roughen the surface of concrete and remove laitance.
2. Wet concrete surface and flush with neat cement grout before placing additional concrete.

D. Expansion joints: Expansion joint filler, where indicated, shall meet "Specifications for pre-formed Expansion Joint Fillers for Concrete Paving and Structural Construction, Non-extruding and Resilient, Non-bituminous. (ASTM D1752-Type 1). Provide "Zip Strip" type filler so that top ½" can be provided for sealant installation.

E. Isolation Joint Material:
1. Provide ½" thick closed cell foam material, separating steel or concrete columns from concrete slab at slabs-on-grade and at elevated slabs to prevent bonding and cracking of concrete from structure movement. Hold down from top of slab ½" and fill with sealant.
2. At perimeter steel edge angles and other floor or wall penetrations where steel angles or framing exists, apply bituminous material on steel where concrete is to be placed to create bond breaker.

F. Column Block-Outs:
1. Unless noted otherwise on drawings, provide round blockouts created by a "Sonotube form" section or other means. **Diamond shaped blockouts will not be accepted.**
2. Provide same Portland Cement manufacturer and mix design for concrete fill in column block-outs as surrounding concrete slab.

G. Finishing:
   1. Floor Finish
      a. Edge forms and intermediate screed strips shall be placed accurately to give the desired elevations and contours. Strike-off templates or straight edges shall be used to give all floor slabs an even surface. Screeds are to be of such type not to interfere with reinforcing.
      b. Troweled finishes shall be applied to floors where concrete is the walking surface, or to have floor coverings. Troweling shall begin after all surface water has disappeared naturally and surface has wood floated to a plane smooth surface. Initial troweling shall be done after concrete has hardened sufficiently to prevent excess fines from working to surface, to produce a smooth surface free from defects and a final troweling shall be done after sufficient hardening to remove trowel marks and give a hard, dense smooth surface. Drying shall be natural. The use of "dryers" by dusting cement or sand is not permitted.

      d. All exterior concrete ramps, stairs, and landing slabs shall have a light broom finish of sufficient texture to prevent slipping.
   2. Walks: See Section 32 16 00

H. Curing: Provisions shall be made for maintaining all concrete surfaces in a continuously moist condition immediately following finishing operations for a period of seven days by one of the following methods when exposed or immediately following removal of forms:
   1. Sprinkling
   2. Absorptive fabric kept continuously wet.
   3. Maintain concrete within 40 degrees F. temperature range while curing for length of time shown below:
      a. Three (3) days for footings.
      b. Seven (7) days for flatwork.
   4. Chemical curing will be considered only when water curing is not practical, such as threat of freezing weather conditions or risk of flooding existing building.

I. Patching: After removal of forms, all honeycomb areas, voids, air pockets, tie holes and surface cracks shall be immediately patched.

   3. Application of Floor Densifier/Hardener:
   1. Apply to interior concrete slabs and exterior porch or patio areas scheduled to be exposed to view.
   2. Apply per manufacturer’s instruction to all exposed trowelled concrete floor areas and other areas as called out on finish schedule. Product to be applied as soon after curing period as manufacturer’s instructions allow. Application must be smooth and even. No excess application or puddling of the product will be allowed.
      a. Clean floors where densifier/hardener is applied with manufacturers cleaners.

3.3 TRENCHING OF EXISTING INTERIOR CONCRETE FLOORS
Unless noted otherwise, provide the following:

A. Sawcut concrete where trenching is required and remove all debris.

B. Fill trench with ½" or less clean washed gravel base and tamp tightly into place in no more than 8-inch lifts.

C. Place 15 mil vapor barrier per Section 07 10 00 over gravel base. Provide 12 inches long standard no.4 rebar, drilled and friction-set 4 inches into sides of existing cut concrete slab at maximum spacing of 24 inches o.c.

D. Place 6 x 6"-W1.4 x W1.4 WWF and pour minimum 4" thick, 3000 p.s.i. concrete. Finish as required for exposed finish of for floor finish scheduled to be installed.

4. Provide sawcut control joints at no more than 8'-0" on center.

3.4 ACCEPTANCE OF CONCRETE:

A. Concrete not meeting the strength requirements of these specifications shall be tested at critical locations designated by the Architect by a laboratory approved by the Architect. These tests shall be at the Contractor's expense. Such tests performed shall be in accordance with the Building Code Requirements for Structural Concrete: (ACI 318-Current Edition). If these tests still indicate below required strengths, or if inconclusive, then the Contractor shall proceed at his own expense as follows:

Remove and replace or reconstruct all under strength concrete in an approved manner or perform load tests in accordance with the "Building Code Requirements for StructuralConcrete" (ACI 318-Current Edition). If load test results are not acceptable then Contractor shall remove and replace or reconstruct all designated under strength concrete to meet requirements of these specifications.

B. Concrete improperly placed, cured, reinforced, damaged or not meeting testing tolerances shall be considered potentially deficient and shall be tested and replaced if necessary, in accordance with Paragraph a) above.

C. Concrete not meeting the tolerances of "Recommended Practice for Concrete Formwork: (ACI 347) and concrete not formed as shown on plans shall be considered as not acceptable and shall be removed and replaced by Contractor at his own expense unless Architect permits patching and repairing of such work. Finished repair work shall meet criteria mentioned above or shall be removed and replaced.

3.5 TESTING AND SAMPLING:

A. Slump Tests: A minimum of two (2) slump tests shall be made each day concrete is placed with one (1) test being made at the time test cylinders are made. Slump tests are to be made in accordance with " Standard Test Method for Slump of Hydraulic-Cement Concrete" (ASTM C-143-Current Edition). Where slump exceeds five inches (5") or the average 28 day strength of the three (3) test specimens falls below the strength specified for the class of concrete tested, or below proportional minimum seven (7) day strengths, (80 percent of specified 28 day strength) the proportions, water content or temperature

conditions shall be changed to secure the required properties, and, at the discretion of the Architect, portions of the structure containing such concrete shall be removed and replaced, or reinforced as necessary. No concrete below 3" slump shall be accepted. Follow guidelines of ASTM C94 for water added to mix on site. Do not exceed design specifications.

B. Strength Tests. The compression strength test shall be performed in accordance with Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens" (ASTM C39-Current Edition). Samples for concrete cylinders shall be made in accordance with "Method of Sampling Fresh Concrete" (ASTM C172-Current Edition), and test cylinders shall be prepared, and laboratory cured in accordance with "Method of Making and Curing Concrete Compression and Flexure Test in the Field" (ASTM C31-Current Edition).

C. Cylinders. Five (5) cylinders from the same batch shall be prepared by a certified technician for each 50 cubic yards or fraction thereof placed, but not less than four (4) cylinders for each day of concrete operations shall be made. **Location of batch as to placement on the subject and supplier mix ID# shall be noted on report, and cylinders so designated. Maximum and minimum initial curing temperatures as recorded per ASTM C31 shall be included in this report.** No tests shall be required for sidewalks. One (1) cylinder shall be tested at seven (7) days and three (3) at 28 days. **If cylinder break is lower than required, the testing company to contact Contractor and Architect immediately for direction. The remaining cylinder shall be maintained in proper curing conditions until specified 28-day compressive strength has been affirmed.**

D. A minimum of nine (9) cylinders shall be tested for each class of concrete used on the project and the average of any three (3) consecutive strength tests at 28 days shall be equal to or greater than the specified strength with no test less than 500psi below the design strength.

E. The contractor shall bear expense of all testing by a Laboratory approved by the Architect prior to award of the contract. Testing results shall be sent directly to the Architect's office, Contractor, and the Concrete Producer. Architect is to be notified of high slump concrete or low early strength (<75% of design at 7 days) immediately.

F. Floor Flatness and Floor Levelness test shall be performed in accordance with “Standard Test Method for determining FF Floor Flatness and FL Floor Levelness Numbers” (ASTM E1155- Current Edition) for entire interior slab on grade.

G. Floor Flatness test shall be performed in accordance with “Standard Test Method for determining FF Floor Flatness Numbers” (ASTM E1155- Current Edition) for entire elevated slab.

END OF SECTION

CONCRETE MIX DESIGN SUBMITTAL FORM

(Section 03 30 00 - Cast-in-Place Concrete)

Submitted Mix Design Date Submitted: _____

Location and Type (pump or chute) of Placement

Concrete Information

Supplier Mix Design #: _____

Design Strength (f'c), psi _____

Water/Cementitious Ratio _____

Total Air Content, % _____

(Entrapped or Entrained) _____

Density:

Wet, pcf _____

Dry, pcf _____

Slump:

Without WR, in. _____

With WE, in. _____

Admixture Information

		ASTM Designation	Product & Manufacturer	Dosage (oz/cy)
Water Reducing				
Accelerating				
Retarding				

Architect's Approval **Structural Engineer's Approval**

Mix Design Proportions Per Cubic Yard

	Identification (Type, size, source)	Weight (lbs)	Density (SSD)	Volume (cubic ft)	% Aggregate Absorption
Cement					
Fly Ash					
C.A. #1					
C.A. #2					
C.A. #3					
F.A. #1					
F.A. #2					
Water					
% Air					
	Totals				

Coarse and Fine Aggregate Gradation

Sieve Size	% Passing Each Sieve (All sieve sizes must be entered)					Combined% Passing	Combined % Retained	
	C.A. #1	C.A. #2	C.A. #3	F.A. #1	F.A. #2		Cumulative	Individual
1-1/2"								
1"								
3/4"								
1/2"								
3/8"								
#4								
#8								
#16								
#30								
#50								
#100								
#200								
% of Vol.								

Required Attachments and Supplemental Documentation

_____ Portland Cement mill test report/certification

_____ Fly ash mill test report/certification

_____ Separate aggregate gradation reports including all required sieve sizes

Note: * All gradation reports shall be dated within 60 days of submittal
* Separate gradation reports required for each coarse and fine aggregate material in the mix

_____ Product data for all admixtures including, but not limited to:

* WR
* Set retarder
* Set accelerator

* Air entrainer

Concrete compressive strength data used for standard deviation calculations

Concrete Supplier Information

Supplier Name: _____

Technical Contact: _____ Cell # _____

Sales Contact: _____ Cell # _____

Primary Plant: _____

Location: _____

Miles from Site: _____

Travel Time to Site: _____

NRMCA Certified (Y/N): _____

AHTD Certified (Y/N): _____

Batch Mixing Typer (Dry/Central Mix): _____

_____

Secondary Plant: _____

Location: _____

Miles from Site: _____

Travel Time to Site: _____

NRMCA Certified (Y/N): _____

AHTD Certified (Y/N): _____

Batch Mixing Typer (Dry/Central Mix): _____

SECTION 04 05 13

MORTAR

PART 1 GENERAL

1.1 SUMMARY

A. Examine all Drawings, General Conditions, Supplementary Conditions, and General Requirements which are part of this Contract. Furnish all labor, materials, and equipment necessary for masonry mortar.

1.2 RELATED SECTIONS

A. Section 04 21 13: Brick Masonry

B. Section 04 22 00: Concrete Unit Masonry

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM-most recent issue)
   1. ASTM C94, Specification for Ready-Mixed Concrete
   2. ASTM C109 Specification for Compressive Strength of Hydraulic Cement Mortars.
   3. ASTM C143, Test Method for Slump of Hydraulic Cement Concrete
   4. ASTM C144, Specification for Aggregate for Masonry Mortar
   5. ASTM C150, Specification for Portland Cement
   6. ASTM C207, Specification for Hydrated Lime for Masonry Purposes
   7. ASTM C270, Specification for Mortar for Unit Masonry
   8. ASTM C404, Specification for Aggregates for Masonry Grout
   9. ASTM C476, Specification for Grout for Masonry
   10. ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
   11. ASTM C1019, Specification for Method of Sampling and Testing Grout
   12. ASTM C1142, Specification for Ready-Mixed Mortar for Unit Masonry
   13. ASTM C1329, Specification for Mortar Cement

B. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

1.4 SUBMITTALS

A. Comply with Section 01 33 00.

B. Submit Certification of mortar components and type for pre-blended masonry mortars such as “Spec Mix” or other approved manufacturers, dated within 12 months of contract date.

1.5 GENERAL REQUIREMENTS

A. Deliver materials in unbroken bags or containers, plainly marked and labeled with Manufacturer's name, brand and mortar type.

B. Storage of Materials
   1. Cement and hydrated lime: Stored in a manner to afford ready access for inspection and in suitable building to protect material from dampness. Insure protection against inclusion of foreign materials in cements and limes. MASONRY CEMENT WILL NOT BE ALLOWED IN MORTAR.
   2. Aggregates - use only clean, dry materials. Use no frozen materials.

C. Build in all sheet metal work, anchors, anchor bolts, hangers, sleeves, thimbles, frames, structural members, etc. as shown and as required for other trades.

D. Environmental Requirements: See Section 04 22 00 for temperature and laying restrictions.
   1. Cold Weather Requirements
      a. Comply with IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
      b. When the ambient air temperature is below 40 degrees F, heat mixing water to maintain mortar temperature between 40 degrees F and 120 degrees F until placed. When the ambient air temperature is below 32 degrees F and holding, dropping, or predicted to drop below 32 degrees, no mortar is to be mixed.
   2. Hot Weather Requirements
      a. Comply with IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

E. Remove any materials that have partially hardened or set. DO NOT USE.

F. Build in door and window frames and their anchors. Slush steel door frame jambs and heads full of mortar. Slush cells full or mortar where excessive cutting for conduit or other devices has weakened masonry.

PART 2 PRODUCTS

2.1 MATERIALS

A. The mortar for all masonry, block, and brick shall meet the minimum requirements of the International Building Code.

B. Mortar shall conform to the minimum proportion requirements given in Table II of ASTM C270, based on 28-day laboratory testing ONLY. Select mortar type based on the criteria below:
   1. Type “S”: For walls in contact with earth or below grade, and load-bearing interior and exterior walls.
   2. Type “S”: For load-bearing walls above grade.
   3. Type “N”: For non-load-bearing walls no higher than 20’-0”.
   4. Use Type “S” for non-load-bearing walls higher than 20’-0”.
   5. Use Type ‘N’ only for masonry veneer.

C. The mortar for all masonry shall color pigmented mortar where exposed to view. Use standard gray color in other areas.

D. Provide only pre-mixed mortar of types specified manufactured by "Spec-Mix" or approved alternate substitution. **Mixing of any mortar on-site will not be allowed.**

E. Use **same** manufacturer's products throughout project.

F. Use of anti-freeze compound or other additives are not to be used without written approval of the Architect.

G. Bond Beams and cells with vertical reinforcement shall be filled with 2000 psi concrete - NOT MORTAR.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150, normal. Type I or III; gray color. Fly ash, slag, and pozzolans are NOT permitted as substitutes for Portland Cement.
   1. For pigmented mortars, use premixed, colored cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer’s standard formulations. Pigments shall not exceed 5 percent of cement by weight for mineral oxides nor 1 percent for carbon black.

B. Hydrated Lime: ASTM C 207, Type S, and UBC 21-13 hydrated lime for masonry purposes.
   1. Manufactured by Chemstar of approved equal.

   2. For pigmented mortars, use colored Portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer’s standard formulations. Pigments shall not exceed 10 percent of Portland cement by weight for mineral oxides nor 2 percent for carbon black.

C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4-inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
   1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match Architect’s sample.

D. Aggregate for Grout: ASTM C404 with 100 percent passing the 3/8" (9.5mm) sieve.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

F. Admixtures: NOT permitted unless approved by the Structural Engineer of Record, prior to construction.
   1. Calcium Chloride is NOT permitted in mortar. Admixtures and other chemicals containing Thiocyanates, Calcium Chloride or more than 0.1 percent chloride ions are NOT permitted.

G. Water: Potable

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions with installer present, for compliance with requirements for installation tolerances and other specific conditions, and miscellaneous conditions affecting performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping and other penetrations prior to installation.

3.2 INSTALLATION

A. Maintain an ambient temperature of the materials in contact with the mortar, of NOT less than 40 degrees F, unless otherwise recommended by the International Masonry All-Weather Council (IMIAC). Maintain this temperature limitation at every area and elevation of weather enclosures, when used.

B. Lay solid brick-sized masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. DO NOT slush head joints.

C. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings, piers, columns, and pilasters, and where adjacent to cells or cavities are to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

D. In existing construction, maintain joint widths shown, to match existing coursing, except for minor variations required to maintain bond alignment. If not shown, lay walls to match existing or 3/8" joints.

E. Cut joints flush for masonry walls that are to be concealed or to be covered by other materials, unless otherwise indicated.

F. Remove masonry units disturbed after lying; clean and reset in fresh mortar. DO NOT pound corners or jambs to shift adjacent stretcher units that have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

G. Grouting: DO NOT place grout until the entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

H. Refer to Section 04 22 00 for maximum allowable grouting heights.

3.3 MIXING OF MORTAR

A. Machine mix in an approved type of mixer in which quantity can be accurately and uniformly controlled. Only small batches of mortar may be mixed at one time. Mixing time is not less than five (5) minutes and not less than three (3) minutes after water has been added. If hydrated lime is used, use dry-mixed method (optional) of first consistently mixing hydrated lime into putty.

B. Dry Blended in Silos: Mixing shall be done using a continuous, self-cleaning mixer mounted at the apex of the silo. The water flow valve shall be set to provide desired workability.

C. Keep all mixers and equipment clean. Do not deposit mortar on the ground.

3.4 WORKMANSHIP

A. Mortar having stood for more than one hour shall not be used or re-tempered.

B. Lay no masonry when danger of freezing conditions exists before mortar sets.

END OF SECTION

SECTION 04 21 13

BRICK MASONRY

PART 1 GENERAL

1.1 SCOPE:

A. Examine all Drawings, Specifications, General Conditions, Supplementary General Conditions, and General Requirements which are part of this Contract. Furnish all labor, material, tools, equipment, scaffolding, and other items necessary to complete all masonry work, with all inclusions, inserts and provisions for inclusion, connection, or passage by other Trades.

1.2. RELATED SECTIONS

A. Section 04 05 13: Mortar

B. Section 05 50 00: Metal Fabrications-Loose lintels, anchor bolts, and steel bearing plates where anchored to, or bear on masonry:

C. Section 07 10 00: Waterproofing and Damp Proofing Through-wall membrane flashing system

D. Section 07 62 00: Flashings and Sheet Metal

E. Section 07 19 00: Water Repellent Coatings

F. Section 07 92 00: Sealants

G. Section 08 11 13: Hollow Metal Doors & Frames

1.3 REFERENCES

A. ASTM A153 – Zinc Coating (Hot Dip)

B. ASTM C67 – Test Methods of Sampling and testing Brick and Structural Clay Tile.

C. ASTM E 835 / E835M – Guide for Dimensional Coordination of Structural Clay Units, Concrete Masonry Units, and Clay Flue Linings.

1.4 MOCK-UP SAMPLE PANEL

A. Before commencing any work, Contractor shall erect a 4' x 4' panel of face brick with correct mortar color. Lay brick in pattern to simulate wall pattern. The panel is NOT PART OF BUILDING and is to remain in place until removal is authorized by the Architect. The contractor shall have sufficient brick on site to erect two panels if necessary.

B. Panel face shall show mortar, bond, widths, and tooling of joints.

C. Approval of Architect is required before proceeding with any part of the building.

D. Panel is to remain in place until completion of the work.

E. Construct mock-up panel in “cut-away” view, exposing all wall assembly components. Refer to Section 01 40 00 Quality Control-Mock-Ups.

PART 2 PRODUCTS

2.1 MATERIALS

A. Brick to be ASTM C652, or ASTM C216 grade SW, Type FBS (ASTM C216 & ASTM C652).

B. Face Brick: All face brick shall be modular type (2-1/4" x 3-5/8" x 7-5/8"), Acme Brick – Garnet Velour.

C All face brick shall be laid in accordance with the standards of Brick Institute of America.

D. Common brick for back-up shall be of sound #1 common brick.

E. **Brick Veneer Anchoring System to CMU Walls:** Provide 170 2X-SH Truss Adjustable Eye-Wire in masonry wall coursing with 3/16” diameter H&B SH 2X Adjustable Veneer Anchor hook ties at 16” o.c. horizontal with continuous “Pencil Rod”, 9 gage, continuous reinforcement at brick. Provide veneer coursing at 16” O.C. vertically. Weld eyes at max. 16" o.c. is to receive adjustable wall tie sections.

F. All ties to be placed so as not to exceed 16" vertically and 16" on center.

G. Gavity Wall Flashing System: Mortar Net “Totalflash” masonry flashing system, or equivalent through wall system components by Hohmann & Barnard. See Section 07 10 00.

H. Weep Vents:
   1. Manufactured by Mortar Net, ½” thick, size as required to match brick head dimension. Refer to Section 07 10 00.
   2. Install at 24” o.c. horizontally.
   3. Provide ventilation vents at top of wall in same location and centering as weep vents.

PART 3 EXECUTIONS

3.1 GENERAL REQUIREMENTS

A. Deliver and store on the site, face brick, sufficient in quantity for the entire job, and secure approval of Architect before placing any of same in the work.

B. Lay no units having a film of water or frost on their surfaces.

C. Lay no masonry when temperature is below 40 degrees F. without Architect's permission. Such permission shall not relieve the Contractor of the responsibility for the work, however. If permitted to work below 40 degrees F., but above 32 degrees F., make provisions to heat and dry materials and protect work from freezing during the installation and curing period. No masonry is to be laid when temperatures are holding, dropping on are predicted to go below 32 degrees F. unless heated protection is provided during installation and curing period and has been approved by Architect.

D. Build in bolts, ties, other metal anchors, sleeves, miscellaneous metals, and wood nailing strips as necessary to secure masonry together or to other materials. Use no continuous wood nailing strips.

E. Build in steel lintels, bearing plates and flashings in contact with masonry. Bed flashing in mortar.

F. Close up any recesses after pipes, ducts, conduits, and other items are in and have been inspected by Architect and/or other proper authorities and do all patching after other trades have completed their work.

G. Cut exposed masonry with masonry saw to produce clean-cut edges.

H. At end of each workday or shut down period cover walls with strong waterproof membrane overlapping walls 12" minimum on each side and securely anchor in place.

I. Use a full height story pole at all corners. Level first and frequent courses with instrument.

J. Carefully ship and stack upon delivery to avoid chipping. Do not stack directly on ground.

K. Cutting and Patching: Consult other trades in advance and make provisions for installation of their work to avoid unnecessary cutting and patching. Do all cutting with a power saw designed for the purpose.

L. Fully butter head and bed joints prior to laying.

3.2 WORKMANSHIP

A. Lay all masonry in full bed of mortar, plumb and true to line with accurately spaced course and reveals. Keep bond plumb throughout, with head points of alternate courses in straight vertical lines.

B. Provide tooled, concave joints where brick will be left exposed as a finished product, unless specifically called out to be otherwise.

C. Where fresh masonry adjoins previously set masonry, clean, roughen, and lightly wet the set masonry before joining with the new.

D. Where stop-offs are necessary in horizontal runs, rake back the unfinished work for joining the new work. Toothing is not permitted unless approved by the Architect.

E. Initial rate of absorption (IRA) of the units is determined by the laboratory method described in Section 9 of Test Methods C67. IRA in the field depends on the moisture content of the masonry unit and is determined in accordance with Section 14 of Test Methods C67. Units having an average field IRA exceeding 30 g/min -30 sq. in. (30 g/min-194 cm squared) should have their IRA reduced below 30 g/min-30 sq.in. prior to laying. It is preferable to wet masonry units thoroughly 3 to 24 hrs prior to their use so as to allow time for moisture to become distributed throughout the unit except when in judgment of Architect the temperature is too low. No freshly wet masonry units or those having film of water or frost on surface shall be laid.

F. Horizontal & Vertical Face Joints: Use tooled joints, approximately 1/4" deep and 3/8" wide.

G. Construction/Control Joints: Construction/Control joints shall be spaced as shown on the drawings, but space no more than 24’-0” o.c. and no more than 12’-0’ from corners. Provide backer rod and caulk joints in accordance with Section 07 92 00.

H. Bond Pattern: Face Brick to be laid in running bond pattern.

I. Where masonry is installed, all vertical and horizontal joints to align according to bond types. Where differing masonry types are installed in same wall, joints are to align between each masonry unit type unless noted otherwise.

3.3 MASONRY WEEPS & CAVITY-WALL FLASHING MEMBRANE TERMINATION

A. It will be the responsibility of the Contractor and the Mason to coordinate installation elevation of all weeps and cavity wall flashing membrane termination in masonry walls at specified locations. Adjust as needed to terminate above concrete walks. Where masonry cavity walls occur at slab-on grade conditions, locate weeps one brick course below finished floor elevation unless items such as a sidewalk, etc, interferes, in which case the weeps would be located at finished floor elevation. If finish grade elevation extends beyond 16 inches below finished floor elevation, locate weeps approximately 2-4” above

finish grade unless noted otherwise. Continue through-wall flashing between weep elevation changes, keeping waterproofing integrity. Finish grade to be a minimum 2" below weeps. **WEEPS ARE TO REMAIN EXPOSED. DO NOT COVER WEEPS WITH SOIL, FLASHING, CONCRETE, OR ROOFING MATERIAL.**

3.4 CLEANING

A. Remove excess materials, mortar droppings. Remove mortar droppings on connecting or adjoining work before its final set.

B. Exposed Masonry: At completion of work, point holes in joints of exposed exterior masonry surfaces, completely fill with mortar, tool properly. After pointing has set, hardened, wet exposed masonry surfaces. Clean soiled surfaces with a solution which will not harm masonry or adjacent materials equal to Sure Klean 600 manufactured by ProSoCo, Inc. Cleaner must be approved by brick manufacturer. Apply with stiff fiber brush, leave masonry clean, free of mortar daubs, with tight mortar joints throughout. Immediately after cleaning, rinse masonry surfaces with clear water. DO NOT USE PRESSURE SPRAY WASHER TO CLEAN OR RINSE OFF MASONRY.

C. Protect all other trade's work and other items set into wall.

D. Remove, replace defective materials, correct defective workmanship, and leave masonry clean.

E. Replace defective mortar. Match adjacent work.

F. Remove excess mortar and smears.

G. Use non-metallic tools in cleaning operations.

3.5 WATER REPELLANT COATING:

A. At completion of cleaning, apply water repellent coating. Refer to Section 07 19 00, Water Repellent Coating.

B. Application is to be done only with approval of the Architect and may be delayed for an extended period due to time of year or weather conditions.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Expanded Polystyrene insulation inserts
   3. Single-Wythe CMU Wall Pan and Weep System
   4. Reinforcement, anchorages, and accessories.
   5. Observation and Required Special Inspections
   6. Mockup panel

B. Products Installed but not Furnished Under this Section:
   1. Section 03 21 00 - Concrete Reinforcement
   2. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
   3. Section 07 62 00 - Sheet Metal Flashings and Trim.

C. Related Sections:
   1. Section 01 40 00 – Quality Control: Required Special Inspections
   2. Section 03 30 00- Cast-In-Place Concrete: grout.
   3. Section 04 05 13 – Mortar
   4. Section 07 27 26 – Fluid-Applied Weather Barrier System
   5. Section 07 21 00 – Insulation
   6. Section 07 92 00 - Joint Sealers: Rod and sealant at control joints.
   7. Section 09 91 00- Painting and Finishing.
   8. Section 09 97 26 - Special Coatings

1.2 REFERENCES

A. ASTM C90 - Hollow Load-Bearing Concrete Masonry Units.

B. ASTM C145 - Solid Load-Bearing Concrete Masonry Units.

C. Hot and Cold Weather Masonry Construction Guide - Recommended Practices and Guide Specifications for Hot & Cold Weather Masonry Construction.
D. ASTM A153 – Zinc Coating (Hot Dip)

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (fm) at 28 days.
   1. For Concrete Unit Masonry: As follows, based on net area:
      a. F’m = 2000 psi (13.1 Mpa).

1.4 SUBMITTAL

A. Submit samples of actual units to be used for Architect's approval.

B. Submit to Architect the insulation type proposed.

C. Submit mix design for concrete grout

1.5 MOCK-UP SAMPLE PANEL

A. Before commencing any work, Contractor shall erect a 4' x 4' panel of each type of CMU specified with correct mortar color. Lay in pattern to simulate wall pattern. The panel is NOT PART OF THE BUILDING and is to remain in place until removal is authorized by the Architect. The contractor shall have sufficient brick on site to erect two panels if necessary.

B. Panel face shall show mortar, bond, widths, and tooling of joints.

C. Approval of Architect is required before proceeding with any part of the building.

D. Panel is to remain in place until completion of the work.

E. Construct mock-up panel in “cut-away” view, exposing all wall assembly components. Refer to Section 01 40 00 Quality Control-Mock-Ups.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: Hot and Cold Weather Masonry Construction Guide - Recommended Practices and Specifications for Cold Weather Masonry Construction.

B. Lay no masonry when the temperature is below 40 degrees F. without Architect's permission. Such permission shall not relieve the Contractor of responsibility for the work, however. If permitted to work below 40 degrees F., but above 32 degrees F., make provisions to heat and dry materials and protect work from freezing during the installation and curing period. No masonry is to be laid when temperatures are holding, dropping or are predicted to go below 32 degrees F. unless heated protection is provided during installation and curing period and has been approved by the Architect.

C. External exposed CMU: Provide units with integral water repellent

1.7 PRE-INSTALLATION MEETING

A. The Contractor will schedule and conduct a pre-installation meeting **prior to construction of cmu walls**. Those attending are to include Contractor, Architect, Owner, Structural Engineer, mason, cmu grout-mix representative and 3rd party special inspector. Items to be discussed are as follows but are not limited to these:
   1. Schedule
   2. Installation of rebar
   3. Required grout mix design strength.
   4. Frequency of testing and inspections
   5. Placement of grout
   6. Construction height of CMU walls
   7. Control joints and corners
   8. Other items associated with cmu wall construction.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Units: ASTM C90, Grade N, Type 1:
   1. Common CMU: Light weight (ASTM C331) above grade; normal weight (ASTM C331) below grade.

B. Solid Load-Bearing Units: ASTM C145, Grade N, Type 1:
   1. Common CMU: Light weight (ASTM C331) above grade; normal weight (ASTM C331) below grade.

C. Masonry Units: Modular units sized as required to achieve details shown; provide special units for bond beams, control and expansion joints, and lintels.
   1. Common CMU: Where indicated on drawings.

D. Quality Control: All standard masonry units shall be manufactured by one manufacturer and shipped from the same plant. All units are subject to inspection and rejection by the Architect for defects such as excessive porous surface, chipped corners, irregular faces or sizes, etc. Sample units submitted shall be retained and shall set the standard for quality expected. Meeting ASTM C90 minimum requirements is not considered to be adequate in the areas mentioned.

E. Fire Resistance Classification: CMU walls and partitions shall have fire resistance ratios as indicated on the drawings. Units shall be of minimum equivalent thickness (ASTM C140) specified for the fire rating and corresponding aggregate type.

2.2 REINFORCEMENT AND ANCHORAGES

A. **CMU Horizontal Joint Reinforcement:** Install horizontal joint reinforcement 16 inches on center, except space at 8 inches in parapet walls and below finished floor, or where otherwise indicated on Drawings. 120 Truss or 220 Ladder-Mesh LoxAll design, manufactured by Hohmann & Barnard, Inc., or approved alternate. Minimum 9-gauge welded steel wire; hot-dip galvanized after fabrication to 1.5 oz. Per ASTM A153 Class B-2 for use in exterior walls, mill galvanized wire for interior walls. Reinforcement width to be 1 1/2 to 2 inches less than wall thickness.

B. Provide reinforcement with receiver eyes for brick veneer. See Section 04 21 13.

C. Miscellaneous Masonry Anchors: Fabricated from l6 gage steel sheet or 3/8 inch steel rod, 1.5 oz. hot-dip galvanized after fabrication.

D. Construction/Control Joints: Construction/Control joints shall be spaced as shown on the drawings. Caulk joints in accordance with Section 07 92 00. Unless shown otherwise less than 24'-0" on center. Provide control joints at corners no more than 12'-0" from corner or closer if shown on drawings. Coordinate locations with Architect and Structural Engineer.

2.3 ACCESSORIES

A. Joint Filler: Closed cell foam, oversized 50 percent; self-expanding joints.

B. Preformed Control Joint Filler:
   1. VS Series by Hohmann & Barnard, Inc.
   2. No. 2901 by Wire Bond.

C. Cavity Wall Flashing System: Mortar Net "Totalflash" masonry flashing system or equivalent thru wall system components by Hohmann & Barnard, See Section 07 10 00.

D. Reinforcing Bar Positioners:
   1. D/A 811; Dur-O-Wal, Inc.
   2. D/A 816; Dur-O-Wal, Inc.
   3. No. 376 Rebar Positioner; Heckman Building Products, Inc.
   4. #RB Rebar Positioner; Hohmann & Barnard, Inc
   5. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
   6. Double O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America
   7. O-Ring rebar Positioner; Masonry Reinforcing Corporation of America.
   8. Hot-dip galvanized after fabrication.

E. Single-Wythe CMU Wall Pan and Weep System. Install at Single Wythe CMU infill at existing exterior wall.
   1. "Block-Flash" CMU Drainage System as manufactured by Mortar Net, Gary, IN. Ph: 1-800-664-6638 or approved alternate.

2. Pan is a high density polyethylene composition .0625 inch thick (1.59 mm) with (7.94) perimeter flange, with a weep spout opening and a 45 degrees drip edge that extends 1.0 inches (25.4 mm) from the outer flange. Specify 8", 10" or 12" wall systems.
3. Integrated web spacer/bridge unit is a high density polyethylene .0625 inch thick (1.59 mm) that overlapped the adjacent pan and extends from face shell to face shell. Bridge is removable for corner installation.
4. Drainage Matte is an open weave polyester mesh (7x16 inch) installed in each CMU cell above the pan.
5. Provide rope weeps or alternate weep type above exterior bond beams at maximum 24" O.C.

2.4 MASONRY FILL INSULATION

A. Expanded Polysytrene insulation inserts, "Icon", Manufactured by Concrete Block Insulating Systems, West Brookfield, MA 800-628-8476, or approved alternate.

B. Install at Single Wythe CMU infill at existing exterior wall.

2.5 CONCRETE GROUT OR SPEC MIX GROUT

A. Concrete grout to be produced at a ready-mix batch plant, capable of producing specified concrete grout or spec mix grout, each as listed below.

B. Concrete Grout:
1. Portland Cement: Type I Portland, meeting "Standard Specifications for Portland Cement", (ASTM C150-Current Edition) shall be used.
2. Aggregates: All aggregates shall be clean, hard strong and durable particles free of chemicals or foreign material that may affect the bonding of cement paste and shall conform to "Specifications for Concrete Aggregates" (ASTM C33). Nominal maximum aggregate size for concrete grout shall be 3/8" diameter.
3. Mixing Water: Water shall be fresh, clean and potable.
4. Slump: 9 inch maximum: plus tolerance 1 inch, minus tolerance 1 inch.
5. Mix proportioning: To produce 28 day minimum compressive strength of moist cured laboratory samples, 2,000 psi at all locations.

C. Spec Mix Grout:
1. Spec Mix Core Fill Grout, Coarse (CF-02), preblended product containing cementitious materials and dried aggregates to meet ASTM C 476 and CSA A179.
2. Packaging: 80lb packages or 3,000lb bulk bags for use in Spec Mix silo system.
3. Mixing Water: Water shall be fresh, clean and potable.
4. Slump: 9 inch maximum: plus tolerance 1 inch, minus tolerance 1 inch.
5. Mix proportioning: To produce 28 day minimum compressive strength of moist cured laboratory samples, 2,000 psi at all locations.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify items provided by other sections of work are properly sized and located.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

3.2 COORDINATION WITH OTHER TRADES

A. It will be a requirement of this section to verify and coordinate work with other trades and specification sections. Do not begin work on concrete slabs on grade or elevated concrete slabs until minimum strength and cure time has been reached.

3.3 COURSING

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8 inches vertically. Form flush mortar joints where joint will be covered by other construction. **Mortar joints on concealed areas where fluid applied cavity wall weather barrier is to be applied must be fully filled with no voids, holes, or cracks, struck flush with the face of CMU**. **Provide tooled, concave joints** where wall will be left exposed and painted, or is a finished product, unless specifically called out to be otherwise.

3.4 PLACING AND BONDING

A. Lay solid concrete masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints. Remove excess mortar.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting courses on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

C. Fully bond intersections, and external and internal corners.

D. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

E. Perform job site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

F. Isolate masonry partitions from vertical structural framing members with a control joint.

G. Where masonry is installed, all vertical and horizontal joints to align according to bond types. Where differing masonry types are installed in same wall, joints are to align between each masonry unit type unless noted otherwise.

3.5 TOLERANCES

A. Alignment of Pilasters: Maximum 1/4 inch from true line.

B. Variation from Unit to Adjacent Unit: 1/32 inch.

C. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet.

D. Variation from Plumb: 1/4 inch per story non-cumulative.

E. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.

F. Variation of Joint Thickness: 1/8 inch in 3 feet.

3.6 REINFORCEMENT AND ANCHORAGES

A. Install horizontal joint reinforcement l6 inches on center, except space at 8 inches in parapet walls and below finished floor, or where otherwise indicated on Drawings.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 24 inches minimum each side of opening. Place joint reinforcement continuous in first and second joint below top of wall.

C. Lap joint reinforcement ends minimum 6 inches. Discontinue at control joints. Extend 24 inches minimum on each side of openings. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.

D. Cells that contain vertical reinforcing are to be grouted full. Lap vertical reinforcing a minimum of 48 bar diameters and ensure bar is positioned in the cell as indicated on the structural plans. **Fill cells in 5'-4" lifts maximum**. Power vibrate grout in each cell full height of each lift. Maximum diameter of power vibrator for grout consolidation is ¾". Maximum allowable CMU height for installing grout in cells is **5'-4"** or to course immediately below bond beam, whichever is lower.

E. Bar Positioners: As vertical reinforcing is being placed, use reinforcing bar positioners for correct bar positioning in the wall. Install at each bar, locating at maximum 8’-0” o.c vertical, and/or at each bar splice point.

F. Verify that anchorages embedded in concrete or attached to structural steel members are properly placed.

G. Reinforce joint corners and intersections with strap anchors l6 inches on center.

3.7 EXPANDED POLYSYTRENE INSULATION INSERTS

A. Install into each cell or each CMU unit unless cell is scheduled to be grouted full.

B. Coordinate with Single-Wythe CMU Wall Pan and Weep System

3.8 LINTELS

A. Install loose steel lintels as scheduled.

B. Install reinforced unit masonry lintels over openings where steel or pre-cast concrete lintels are not scheduled. Construct lintels using concrete fill and reinforcing. Maintain minimum 8 inch bearing on each side of opening.

C. Use reinforcing bars of one piece lengths only.

D. Place and consolidate grout fill without disturbing reinforcing. Allow lintels to reach strength before removing temporary supports as affirmed by laboratory compressive strength testing of field-cast grout prisms.

3.9 CONTROL JOINTS

A. Do not continue horizontal joint reinforcing thru control joints. Continue bond beams across control joints by use of "Slip Joints" as detailed on plans. Ensure use of asphalt paper wrap to create bond break. 3/4” diameter x 24” dowels with expansion cap at each bond beam at each control joint.

B. Install preformed control joint filler at locations indicated on Drawings. Space no further than 24'-0" o.c. or less if shown on drawings. Provide control joints at corners no more than 12’-0” or closer if shown on drawings. Use proper size material to create sealant joint space; See Section 07 92 00 for sealant performance.

3.10 SINGLE-WYTHE CMU WALL PAN AND WEEP SYSTEM

A. Install system, following manufacturer’s directions.

B. Provide pan and weep system at bottom of wall, above bond beams at all door and window openings, and above all lintels and mid-wall bond beams. Follow manufacturer's directions when installing for each of these conditions.

3.11 BUILT-IN WORK

A. As work progresses, build in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.

B. Build in items plumb and level.

C. Bed anchors of metal doors in mortar joints. Fill masonry cores with grout minimum l2 inches horizontally from framed openings.

D. Build in door frames and their anchors. Slush steel door frame jambs and heads full of mortar. Slush cells full of mortar where excessive cutting for conduit or other devices has weakened masonry

E. Do not build-in organic materials subject to deterioration.

3.12 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other Sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

C. **Do not** thin CMU walls to accommodate plumbing piping, electrical conduit of other items routed in CMU walls. Consult Architect if conditions are found that do not allow proper installation of CMU.

3.13 TESTING CMU CONCRETE GROUT OR SPEC MIX GROUT

A. Strength Tests:
   1. Testing per ASTM C 1019.
   2. Three (3) test specimens shall constitute one (1) sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
   3. Slump to be 9 inches, plus or minus one inch.
   4. Specimens shall be tested at 7 and 28 days.
   5. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi..

B. Frequency: Minimum of Two (2) times a week from start of production.

C. Testing Laboratory: The testing laboratory, in addition to meeting requirements of ASTM E-329, and must be an approved laboratory competent to perform cement physical testing. All tests must be performed in strict accordance with the applicable ASTM standard.

D. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Architect, Contractor, masonry contractor, and the grout supplier if applicable.

E. Test mix design prior to beginning construction of CMU walls. The compressive strength test of the laboratory mix design must meet or exceed the specified 28 day design compressive strength of **2,000** psi grout unless noted otherwise.

F. Contractor shall bear costs for all masonry testing.

3.14 CLEANING

A. Remove excess materials, mortar droppings. Remove mortar droppings on connecting or adjoining work before its final set.

B. Exposed Masonry: At completion of work, point holes in joints of exposed masonry surfaces, completely fill with mortar, tool properly. After pointing has set, hardened, wet exposed masonry surfaces. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials equal to Sure Klean 600 manufactured by ProSoCo, Inc. Cleaner must be approved by CMU manufacturer. Apply with stiff fiber brush, leave masonry clean, free of mortar daubs, with tight mortar joints throughout. Immediately after cleaning, rinse masonry surfaces with clear water. DO NOT USE PRESSURE SPRAY WASHER TO CLEAN OR RINSE OFF MASONRY.

C. Protect all other trade's work and other items set into wall.

D. Remove, replace defective materials, correct defective workmanship, and leave masonry clean.

E. Replace defective mortar. Match adjacent work.

F. Remove excess mortar and smears.

G. Use non-metallic tools in cleaning operations.

3.15 WATERPROOFING

A. At completion of cleaning, apply waterproof coating at exposed exterior CMU walls and where called for unless noted otherwise. Refer to Section 09 97 26, Special Coatings.

3.16 AIR / MOISTURE BARRIERS

A. Prior to installation of veneer at cavity wall construction with CMU backup, apply Liquid-Applied Cavity Wall Moisture/ Air Barrier on all CMU walls where concealed in cavity wall. Refer to Section 07 27 26, Fluid Applied Weather Barrier System.

3.17 PROTECTION

A. Maintain protective boards at exposed external corners which may be damaged by construction activities.

B. Provide protection without damaging completed work.

B. At day's end, cover unfinished walls to prevent moisture infiltration. Secure cover down to prevent blow-off and maintain protection for fresh masonry work.

3.18 OBSERVATION AND SPECIAL INSPECTIONS

A. CMU placement and CMU reinforcement and placement shall be periodically observed by the Architect/Engineer during laying of CMU units. Inspection of CMU placement and CMU reinforcement and placement for conformance to the construction documents shall be completed by the designated third party Special Inspector at a minimum frequency of two (2) times per week from start of production.

B. Special Inspector Qualifications: Latest Edition of Arkansas Fire Prevention Code/ IBC. Allowable certifications include: Arkansas Licensed PE, Arkansas EIT working under a PE, ICC masonry certified technician, or NCMA (National Concrete Masonry Association) certified technician.

END OF SECTION

SECTION 05 12 23

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. This section shall cover the furnishing, fabrication, erection and connection of all structural steel complete.

1.2 WORK INCLUDED & FURNISHED

A. All labor, tools, materials, scaffolding, bracing, cranes, hoist, and other construction equipment required for the completion of the structure.

B. Preparation of shop drawings.

C. Furnishing and fabrication of all structural steel and miscellaneous metal work including beams, columns base plates, cap plates, bearing plates, angles, struts, bracing, girts, girders, connection material, fasteners, anchor bolts, shims, loose lintels, stiffeners, hangers, brackets, rods, and welding material.

D. Shop and field painting.

E. Shop and field connections including temporary bracing.

F. Section 01 40 00 – Quality Control: Required Special Inspections

1.3 QUALITY ASSURANCE

A. Fabricator's Qualifications: **A qualified fabricator that is AISC Certified for conventional steel building structures. If fabricator is not an AISC certified plant, then the fabricator must meet the protocol for special inspection requirements of IBC, Section 1704, paragraphs 1704.2.5 and 1704.2.5.1.** Documentation that one of the above requirements is met must be submitted to the Architect before starting shop drawings.

1.4 RELATED SECTIONS

A. Section 01 40 00 – Required Special Inspections
B. Section 03 30 00- Cast-in-Place Concrete
C. Section 05 50 00 - Metal Fabrications
D. Section 07 81 16- Spray-on Fire-proofing

1.5 FURNISHED BUT INSTALLED ELSEWHERE

A. Anchor Bolts, Loose Bearing Plates: Refer to Sections 2 and 7d of AISC Code of Standard Practice.

B. Loose Lintels: Refer to Section 7f of AISC Code of Standard Practice.

1.6 STANDARDS

A. Structural Steel fabrication, connections, detailing and erection shall be in accordance with the specifications for the "Design Fabrication and Erection of the AISC Manual of Steel Construction, unless indicated otherwise in these specifications or on plans.

B. All structural steel shall conform to standard specifications for structural steel, ASTM A36, except:
   1. Wide Flanges and WT Tees - ASTM A992, Fy=50 ksi
   2. Structural steel tubing - ASTM A500 Grade C, Fy=50 ksi.

   4. Anchor Rods – ASTM F1554, Grade 36
   5. Headed Stud Anchors - ASTM A108, Fy=50 ksi.
   6. High Strength Bolts – ASTM A325

1.7 SHOP DRAWINGS

A. Comply with Section 01 33 00. When corrections are required, reproducibles will be returned noting such. Drawings will then be corrected and resubmitted until final approval is received. Items not noted as requiring corrections may be fabricated after return of a previous submittal even though drawings shall be such that corrections noted on one sheet that affect another drawing will be transmitted and made on all sheets and also resubmitted.

B. The Contractor will be responsible for checking quantities and dimensions in accordance with contract drawings. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions then will be furnished by the Architect. Contractor shall coordinate any dimension changes or additions with fabricator.

C. Contract drawings receive precedence over shop drawings unless authorized in writing. Approval of shop drawings does not grant authorization of change to contract.

D. Standard AWS symbols shall be used and shown for all welded connection details for both shop and field welds. Joint reference numbers as noted in part 4 of 7th Edition of AISC "Manual of Steel Construction" shall be shown where full strength welds are required.

E. All splices and connections, both shop and field, shall be detailed on shop drawings.

1.8 PRODUCT HANDLING

A. Delivery of materials to be installed under other sections:
   1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in- place concrete operations or masonry work.
   2. Provide setting drawings, templates, and directions for the installation of the anchor bolts.

B. Storage of Materials
   1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.
   2. Steel shall be protected from corrosion.
   3. Other materials shall be stored in a weather-tight and dry place, until ready for use in the work.
   4. Packaged materials shall be stored in their original unbroken package or container.

1.9 COOPERATION WITH OTHER WORK

A. Fabricator shall punch all necessary holes and provide the connection material required for the attachment of miscellaneous items, such as nailers, hangers and mechanical equipment framing. Contractor shall coordinate such work with all plans.

1.10 WORKMANSHIP

A. All welding, both shop and field welding, shall be made by welders qualified by tests as prescribed in the "Code for Welding in Building Construction" (AWS D1.1-Current Edition).

B. All fabrication and erection work shall be performed by skilled workmen, working under experienced supervision.

1.11 CERTIFICATION

A. Pre-engineered metal building fabricator/manufacturer to be A.I.S.C. Certified.

B. Submit copy of certificate with shop drawings or upon request by Owner or Architect.

1.12 UNIT PRICES

A. Provide cost per ton and provide for one (1) ton of miscellaneous beams, channels, and angles in addition to the steel framing shown on the plans and details. Contractor shall include fabrication, design, installation and erection cost for the additional framing in the unit price.

PART 2 PRODUCTS

2.1 MATERIALS

A. All structural steel shall meet the specifications for "Structural Steel" (ASTM A36). Except wide flanges and tees shall conform to ASTM A992, Fy=50 ksi, steel tubes shall conform to ASTM A500, Grade C, Fy-50 KSI, and steel pipe shall conform to ASTM A501.

B. Purlins and eave struts shall have a minimum 55,000 psi yield strength. Purlin and eave strut supplier shall submit calculations sealed by an Arkansas Professional Engineer, meeting the load and deflection requirements shown on the drawings.

C. Filler Metal for Welding shall conform to one of the following:
   1. Manual Shielded Metal Arc Welding - E70 Series of the "Specifications for Mild Steel covered Welding Electrodes" (AWS A51-Current Edition).
   2. Submerged Arc Welding - F70 AWS-flux Series of the "Specifications for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding" AWS 5.17-96.

D. Bolts
   1. High Strength Bolts shall be A325 bolts meeting the requirements of "Specification for Structural Joints Using ASTM A325 or A490 Bolts", including suitable nuts and plain hardened washers.
   2. Other bolts shall conform to "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners" (ASTM A307).

2.2 CONNECTIONS

A. Type
   1. Unless indicated and detailed otherwise on plans, all connections shall be detailed and designed by the fabricator as unrestrained flexible connections described as Type 2 construction in Section A2.2 of the most current edition of the AISC manual of Steel Construction, but provisions must be made for excessive eccentric connections. All connections shall be in accordance with Part 4 and Part 5 of the above cited AISC Manual.
   2. Bolted Connections
      a. All bolted connections, unless noted otherwise, shall be A325 high strength steel bolts, nuts and harden washers, conforming to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
      b. All bolted connections, unless noted otherwise, shall be of bearing type with threads included in the shear planes. These bolts shall be snug tightened. The snug-tight condition is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
      c. Bolts, nuts and washers shall conform to Tables 1 and 5 of Specifications and Commentary for "Structural Joints, Using ASTM A325 or A490 Bolts" of Current Edition of AISC Manual of Steel Construction.
      d. Bolted parts shall be fitted tightly together before bolt installation.

e. All bolts shall have one nut and a hardened washer under the turning element.
f. When surface of bolted part in contact with nut or bolt head exceeds a slope of 1:20 with respect to a plane normal to the bolt axis, smooth beveled washers shall be used.
g. Bolt assembly and contact surfaces shall be free from scale, burrs, dirt and other foreign matter which might prevent solid seating.
h. Minimum bolt size, unless noted otherwise, shall be 5/8" in diameter. Adequate "stick through" for bolts must be provided in accordance with section C2 and Table 6, pages 5-201 and 5-202 of reference cited in part c) of the section.
i. All bolts at the column cap plates shall be installed with the bolt on top and the nut below the cap plate.

3. Welded
   a. Minimum size of fillet weld permitted shall be 3/16", unless noted otherwise.
   b. All surfaces to be welded shall be free from loose scale, slag, rust, grease, paint and other foreign materials.
   c. All welding shall be in accordance with AWS "Structural Welding Code" (AWS D1.1-Current Edition) and as illustrates and described in "Welded Joints" in Part 4 of the 7th edition of the AISC Manual of Steel Construction.
   d. Shop welding and field welding shall be performed by a certified welder in accordance with AWS D1.1-2000, licensed in the State of Arkansas.

PART 3 EXECUTIONS

3.1 FABRICATION

A. Connections and Splices
   1. Shop connections and splices may be bolted or welded.
   2. All holes for bolts shall be punched or drilled without ragged or torn edges. Finished holes for bolts shall be 1/16 inch larger than nominal diameter of the bolt.

B. Metal Preparation
   1. All metal shall be properly prepared before shop connections are made in accordance with welding and bolting requirements of these specifications, AISC and AWS standards.
   2. All completed members shall be straight, without kinks, twists, bulges, bends and open joints.
   3. Shearing, punching and cutting of materials shall be without torn or ragged edges.
   4. Holes too small to meet above requirements shall be enlarged without distortion to the metal by reaming.
   5. Bolted parts, when assembled, shall be fabricated so that the bolts will enter without distortion.
   6. Compression members shall have milled or sawed shop ends and joints.
   7. Open holes necessary for connection of other work shall be provided at time of fabrication. Contractor shall coordinate work with that of other trades.
   8. Grind all factory or field welds where exposed to achieve smooth consistent surface. Field-apply primer (or galvanized paint if metal is galvanized) immediately following grinding.

C. Painting
   1. All steel work except that encased in concrete or otherwise noted, shall receive one shop coat of a rust inhibitive paint meeting Federal Specification TT-P-636 with a minimum dry paint film thickness of 2.0 mils.
   2. All metal shall be free of dirt, grease, rust, mill scale, oil and other foreign material, and shall be wire brushed before painting.
   3. Where spray-on fire-proofing is to be applied, steel shall be unprimed and unpainted.

D. Tolerances
   1. Fabrication tolerances shall be in accordance with AISC Manual of Steel Construction- Current Edition.

3.2 ERECTION

A. Precautions
   1. The Contractor shall take necessary precautions to secure all steel against movement during erection and that bracing as noted in the remainder of this section of the specifications is installed.

B. Base Connections
   1. Anchor rods shall be placed and accurately located in footings, piers, and walls in advance of column erection.
   2. Column bases shall be set level, using steel shims on four corners and grouted solid to ensure full bearing contact on foundation or support material.
      a. Grout shall be a minimum of 1" thick, high strength, non-metallic, non-shrink, damp packed consistency construction grout.
   3. Column bases are designed as unrestrained and all columns require temporary bracing until all framing and erection work is secure and in place.

C. Field Connections
   1. Field connections may be either welded or bolted.
   2. As erection work progresses, all steel work shall be secured and fastened with either temporary or permanent connections.
   3. Bolts exposed to weathering or to earth shall be dipped in a rust inhibitive paint prior to installation.
   4. Gas cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.
   5. All beams with or without bearing plates shall be set in 1 to 1 mix of sand and Portland cement so as to ensure full contact bearing.

D. Bracing - All structural steel shall be braced, guyed and stayed to prevent lateral or vertical movement against construction loads, dead loads, wind forces and erection forces. Such bracing shall remain in place until secured and all exterior walls are in place.

E. Field Painting
   1. Damage of shop paint or exposed rusted metal spots shall be cleaned and painted before erection. Paint shall be same as applied by fabricator.

2. After erection, all steel exposed to earth or weather shall be painted with a 2nd coat of rust inhibitive paint.
3. After erection, all abrasions or damaged paint marks, including bolts, nuts and welds, shall be touched up with shop paint by the erector.
4. See Section 09 91 00 for finish coats required.

F. Tolerances - Erection tolerances shall conform to part b) of section 7 of AISC "Code of Standard Practice for Steel Buildings and Bridges", as stated in the 7th Edition of AISC Manual of Steel Construction or most current edition.

G. Purlins: Alignment of purlins shall vary no more than ¼" at mid-span for 20'-0" lengths or 3/8" for 40'-0" lengths, measured transverse to purlin/girt span. This shall be checked by string-line from ridge to eave for purlins. Verification shall be given to Architect prior to panel installation that these minimum requirements have been achieved. Notify Architect 24 hours prior to verifying alignment.

3.3 IMPROPER FIT OF STEEL WORK

A. All framing or connections that do not properly fit, or are not located according to plans, shall be modified or replaced at contractor's expense. Contractor shall submit to the Architect drawings and proposals for modifications and replacement, for approval. No work shall proceed until approval is received, but temporary shoring and bracing shall be placed until approved corrections are made.

3.4 SPECIAL INSPECTIONS

A. Inspection of Steel structure placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third party Special Inspector.

END OF SECTION

SECTION 05 21 00

OPEN WEB STEEL JOISTS

PART 1 GENERAL

1.1 SCOPE

A. This section shall cover the furnishing, fabrication, erection and connection of all steel joists complete.

B. Work Included and Furnished
   1. All labor, tools, materials, scaffolding, bracing cranes, hoists and other construction equipment required for the completion of the roof and floor structures in accordance with drawings and these specifications.
   2. Preparation of shop drawings.
   3. Furnishing of all steel joists including bridging, bearing plates, bracing, anchors, headers, joist extensions, shims, welding material and bolting material.
   4. Shop and field painting.

1.2 RELATED SECTIONS

A. Section 01 40 00 – Required Special Inspections

1.3 STANDARDS

A. Open web steel joist materials and fabrication, connections, anchorage, detailing and erection shall be in accordance with the latest Edition of "Standard Specifications and Load Tables" as published by the Steel Joist Institute, except where additional or more stringent requirements are noted here in these specifications. Fabricator must have SJI certification.

1.4 SHOP DRAWINGS

A. Shop drawings shall be submitted by the Contractor to the Architect and approval received prior to fabrication. Submit as per Section 01 33 00. When corrections are required, copies shall be returned noting such corrections. Fabrication may be done on items not requiring correction even though drawings must be returned.

B. Steel joist fabricator shall submit a certificate of compliance with the IBC, Sec, 1704, (copy to be included in the close out documents as part of the shop drawing submittal.

C. Shop drawings must be signed and stamped by a registered structural engineer licensed in the state project is being constructed.

D. The Contractor shall be responsible for checking of quantities and dimensions before submittals.

E. Contract drawings receive precedence over shop drawings unless authorized otherwise in writing.

F. All connections, including those made in the field, shall be shown and detailed. Welds shall be indicated with American Welding Society symbols.

G. All materials incorporated into fabrication shall be noted as to grade.

1.5 WORKMANSHIP

A. All fabrication and erection work shall be performed by skilled workmen working under experienced supervision.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide joists as shown on drawings, manufactured by Vulcraft or approved alternate.

PART 3 EXECUTIONS

3.1 FABRICATION

A. All joists shall be manufactured in accordance with requirements of Steel Joist Institute or requirements of American Institute of Steel Construction. Manufacturing companies who are not members of these Institutes shall submit certification that steel joists furnished meet requirements of Steel Joist Institute previously noted in these specifications prior to fabrication.

B. All joists shall be painted with one shop coat of red or gray primer of type specified in Steel Joist Institute "Standard Specification and Load Tables". Where spray-on fire proofing is scheduled, joists to be unprimed.

C. Joists shall be cambered in accordance with recommended camber as noted in Section 4.7 of Steel Joist Institute "Standard Specification and Load Tables" unless noted otherwise on plans.

3.2 ERECTION

A. Spacing
   1. Joists shall be spaced and located according to contract plans.

B. Bearing and Anchorage
   1. Joists shall have a minimum bearing of 4 inches on concrete or masonry and shall be anchored thereto by bolting or welding.
   2. Joists bearing on steel shall have a minimum bearing length of 2 1/2 inches and shall be bolted or welded thereto.

3. Joists parallel to walls shall be anchored directly to the wall at lines of bridging. Both top and bottom chords shall be anchored.
4. Joists with welded connections shall be welded on each side with 1/8" x 2-1/2" fillet welds for K-joists. *Or as shown on the structural plans.*

C. Bridging
1. Bridging shall be of size and type indicated on the shop drawings. Bridging shall be installed as soon as joists have been erected and before application of any construction load or service loads.
2. Bridging shall be welded at top and bottom chords, unless noted otherwise.
3. Bridging shall be connected to wall, column or beams at end of bridging lines.
4. In certain locations special bridging conditions may exist to coordinate with ductwork, specialty items, etc. Indicate these bridging conditions on shop drawings.

D. Extensions and Strut Bracing
1. Strut bracing to beam flanges shall be provided where noted on plans.

E. Framing for Openings
1. See details on structural drawings.

3.3 FIELD PAINTING

A. Damage of shop coat or rusted or exposed metal shall be cleaned, wire brushed and painted before erection with same paint applied by fabricator.

B. All abrasion or damaged paint marks, including weld areas, shall be touched up with shop paint after erection.

3.4 SPECIAL INSPECTIONS

A. Inspection of steel joist placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third-party Special Inspector.

END OF SECTION

SECTION 05 31 23

METAL DECKING - ROOF

PART 1 GENERAL

1.1 SCOPE

A. This section shall cover all furnishing, fabrication, connection and erection of steel roof deck complete.

1.2 WORK INCLUDED AND FURNISHED

A. All labor, tools, materials, scaffolding, bracing hoists and other construction equipment required for the complete erection and installation of roof deck.

B. Shop drawings showing complete erection details shall be submitted in quadruplicate to the Architect for approval before fabrication is begun.

C. Furnishing of steel deck, accessories and clips necessary for the completed deck, including rubber type and closures.

D. Shop and field painting.

1.3 RELATED SECTIONS

A. Section 01 40 00 – Quality Control: Required Special Inspections

B. Section 05 12 23: Structural Steel

C. Section 05 21 00: Open Web Steel Joists

D. Section 05 50 00: Metal Fabrications

1.4 STANDARDS

A. Design properties shall be computed in strict accordance with the latest edition of "Specifications for the Design of Light Gage Structural Members" of the AISI. Steel decking shall meet SDI Specifications and Certification.

PART 2 PRODUCTS

2.1 MATERIALS

A. Roof deck shall be manufactured from steel conforming to A-1008 having a minimum yield value of 33,000 P.S.I.

B. Steel roof deck as installed shall be capable of supporting a total load of 50 P.S.F. with a maximum bending stress of 20,000 P.S.I. with a maximum deflection of L/240 of the span for a live load of 30 P.S.F., but in no case shall properties of the deck be less than that indicated on plans or herein these specifications.

C. Deck shall be steel sheets with a shop coat of primer.

D. Steel Deck Types
   1. **1 ½" Steel Deck:** Deck shall have continuous integral ribs 1 1/2" deep, spaced no more than 6 1/4" on center. Ribs at bearing points shall be commonly referred to as "wide rib". Gauge of material shall be as noted on contract plans, but in no case shall be less than 22 gauge, `B' deck.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install roof deck units and accessories in accordance with manufacturer's recommendations and shop drawings.

B. Placing Roof Deck Units.
   1. Position roof deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened.
   2. Lap ends not less than 2 1/2 inches. Laps shall occur at a support.
   3. Do not stretch or compress the side lap interlocks.
   4. Place deck units flat and square, and secure to adjacent framing without warp or deflection.

C. Fastening Deck Units
   1. Secure roof deck units to supporting members with 5/8" diameter puddle welds at spacing as noted in structural notes on structural drawings.
   2. Welding to conform to AWS D1.1-Current Edition.
   3. Side laps shall have 2 #10 screw fasteners between each support, or welded according to structural notes on structural drawing.

D. Cutting and Fitting
   1. Cut and fit roof deck units and accessories around projections through roof decking.
   2. Make cuts neat, square, and trim.

3. Cut openings in roof deck true to dimensions using metal saws, drills or cutting torches.
4. Do not use cutting torches where a finished appearance is required.

E. Closure Strips: Install closure strips at all open uncovered ends and edges of roof decking, and in voids between decking and other construction.

F. All erection work shall be coordinated with other trades to provide the necessary vents, hangers, openings, etc. required.

G. After installation, deck shall be a continuous, clean, dry surface ready for roofing materials.

H Architect and structural engineer shall observe the finished roof deck prior to placing of covering materials.

3.2 JOINT SEALING

A. Remove dust, dirt, and moisture from joint surfaces.

B. Apply sealant in accordance with manufacturer's instructions.

3.3 TOUCH-UP PAINTING

A. Wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

B. Touch-up shop painted surfaces with same paint used in shop, and apply as recommended by manufacturer.

C. Touch-up paint shall match existing paint in exposed areas.

3.4 SPECIAL INSPECTIONS

A. Inspection of steel deck placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third-party Special Inspector.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials for installation of miscellaneous metal products as indicated on plans and/or specified herein.

1.2 INTEGRATION WITH OTHER TRADES

A. Each Trade shall provide all items necessary to be built into masonry, concrete, tile, etc., prior to when needed. Contractor is to be responsible for coordination and scheduling of such items.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 40 00 – Quality Control: Required Special Inspections

B. Section 03 30 00: Cast-in-Place Concrete:

C. Section 09 91 00: Painting and Finishing

1.4 QUALITY

A. Welders: Use only certified welders in accordance with AWS D1.1-Current Edition., licensed in the State of Arkansas.

B. Codes and Standards
   1. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", A.I.S.C.
   2. "Code for Welding in Building Construction", American Welding Society.
   3. Applicable codes and ordinances.

1.5 SHOP DRAWINGS

A. Comply with requirements of Section 01 33 00.

PART 2 PRODUCTS

2.1 METALS

A. Metals shall conform to applicable ASTM specifications, including but not limited to:
   1. Steel wide flanges and tees ASTM A992 with 50 KSI yield strength

2. Standard steel pipe ASTM A501
3. Steel tubing ASTM A500, Grade C
4. Steel plate ASTM A36
5. Other Structural Steel ASTM A36
6. Bolts ASTM A325
7. Anchor Rods – ASTM F1554, Grade 36
8. Exterior steel angle lintels and exposed steel plates and bent plates – Galvanized finish, hot dipped, ASTM 385/385M-15, grade 65.

2.2 PAINT

A. Primer paint: Manufacturer's standard, compatible with finish coat paint specified in Section 09 91 00.

B. Dissimilar metals shall be protected from galvanic action by coating with one coat of zinc chromate primer prior to assembly.

2.3 MISCELLANEOUS ANCHORS:

A. Furnish anchor rods and miscellaneous anchors as required except where such items are specified in other sections of these specifications, or where customarily furnished with the items to be attached.

2.4 MISCELLANEOUS ITEMS

A. Furnish and install where shown in accordance with drawings and details other items of miscellaneous metals except where same are specified in other sections of these specifications. These items to include, but not be limited to:
   1. Slip angles, stiffener channels, equipment frames, legs, supports, etc.
   2. All other materials, not specifically described, but required for a complete and proper installation.

PART 3 EXECUTION

3.1 QUALITY CONTROL

A. All material shall be new, of the best quality, and subject to the approval of the Architect.

B. Weld or rivet permanent connections; do not use screws or bolts where they can be avoided.

C. Fastenings shall be concealed where practical, and heads countersunk where required. Use lock washers to prevent loosening.

D. Provide holes and connections for the work of other trades.

E. Welds in flat surfaces, where exposed in finished rooms, or where noted shall be ground smooth and exposed corners or edges shall be rounded where practicable.

F. All items shall be properly located, set level, plumb, square and in alignment, and shall be securely attached.

G. Grind all factory or field welds where exposed to achieve smooth consistent surface. Field-apply primer (or galvanized paint if metal is galvanized) immediately following grinding. Paint all exposed steel per section 09 91 00.

H. Provide galvanized finish on exterior, exposed angle lintels, exposed steel plates and steel bent plates unless noted otherwise, Provide galvanized finish on other items where specified and called for.

3.2 TOUCH-UP PAINTING

A. Wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

B. Touch-up shop painted surfaces with same paint used in shop, and apply as recommended by manufacturer.

C. Touch-up galvanized welded areas with Galvilite By ZRC Products Company, or approved equal.

3.3 SPECIAL INSPECTIONS

A. Inspection of miscellaneous metal placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third-party Special Inspector.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install all wood framing members, stripping, blocking, grounds, pressure treated wood, fire treated wood, equipment curbs and cants, and other miscellaneous.

1.2 PRODUCT HANDLING

A. Protection:
   1. Store all materials in such a manner as to ensure proper ventilation and drainage, and to protect against damage and the weather. Store in a well-ventilated building where not exposed to extreme changes of temperature and humidity.
   2. Keep all materials clearly identified with all grade marks legible. Keep all damaged material clearly identified as damages, and store separately to prevent its inadvertent use.
   3. Do not allow installation of damaged or otherwise non- complying material.
   4. Use all means necessary to protect the installed work and materials of all other trades.
   5. Protect all metal products with adequate waterproof outer wrappings.
   6. Use extreme care in off-loading of lumber to prevent damage, splitting, and breaking of materials.

1.3 ECOLOGICAL PRESERVATION

A. Contractor will not use old growth Western Red Cedar, Sitka Spruce, Western Hemlock, Pacific Fir, or Coastal Redwood unless it is recycled. Only upon written request, under unusual circumstances, will use of any of these species be considered by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials herein specified: The best of their respective grades, conforming to grading rules of lumber association under which they are produced, thoroughly seasoned or kiln dried. Protect and cover in shipment and on job site.

B. Framing lumber and miscellaneous blocking - No. 2 Grade Douglas Fir, or Southern Pine, S4S in conformance with ASTM 245- 69 grading, or as otherwise specified on plans.

C. Pressure treated wood:
   1. Use arsenic-free pressure treated lumber, Copper Azole Type-B (CA-B), Alkaline Copper Quat (ACQ), or approved equivalent product conforming to American Wood Preservers Association standards for use above ground in all places where lumber is used in contact with masonry work and concrete. Where used with roofing, at roof curbs, parapet caps,

roof edge member or roof cant strips, whether noted on plans or not, type MCA treatment is acceptable.
2. Use minimum 0.40 Lbs./Cu. Ft. retention for ground contact lumber, and 0.25 for above ground applications.
3. Pressure treated wood shall leave no apparent odor or stain in the completed work.
4. Fasteners shall be stainless steel or hot-dipped, galvanized conforming to ASTM A-153.

D. Fire treated wood: All concealed lumber, wood products and wood materials used in construction that are to remain as part of the finished work, shall be fire retardant treated, Pyro-Guard manufactured by Hoover Treated Wood Products, PO Box 7807, Pine Bluff, AR 71611 (501)247-3511, or approved alternate. Flameproof treatment shall be tested to produce a flame spread of 25 or less as determined by Underwriters Laboratories in the extended 30 minute duration of ASTM E-84, "Standard Test Method for Surface Burning Characteristics of Building Materials.". Provide with 20 year manufacturer's warranty.
1. For IBC type I and type II construction, concealed lumber used for blocking in attachment of handrails, toilet accessories, markerboards, etc. is not required to be fire treated.
2. Isolate metal materials coming in contact with Fire treated wood with 30# felt.

E. Plywood and Lumber:
1. Plywood to meet performance standards for its type as described in Product Standard PS 1 for Douglas Fir plywood. Provide exterior type plywood for permanently exposed plywood in outdoor applications.
2. Provide lumber for structural carpentry using the following species provided grade for each is not lower than minimum shown:
Fir, Douglas – WCLIB, Standard
Pine, Southern Yellow - SPIB Rules, No. 2 Common
3. Pressure treat concealed wood including lumber, grounds, nailers, blocking, backing, rough framing, and lumber in contact with the ground, in contact with concrete or masonry within 24" of the ground, installed on or above roof deck, and as required, complying with published standards or the American Wood Preserver's Association.
4. Plywood not otherwise specified or not on the drawings: Douglas Fir or Southern Yellow Pine panels, C-D grade for concealed applications and A-C grade for exposed applications, meeting US product standard PS1. Furnish plywood for underlayment using underlayment grade with exterior glue.
5. Exterior Plywood: APA CDX, exposure 2 with exterior glue thickness as called for. Butt joint and tongue & groove. See drawings.
6. Interior Plywood: Thickness & type indicated on drawings;
APA A-D INT, where exposed one side (ie. shelving, panel boards, etc.)

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Framing: Frame, fit closely, set framing according to required lines, levels and secure rigidly in place.

B. Grounds and Blocking: Provide wood grounds and blocking of size and shape required to secure other work or equipment in place. **NO METAL STRAPPING WILL BE ACCEPTED AS A SUBSTITUTE FOR WOOD BLOCKING.** Set grounds true to line, level or plumb and well secured in place. Wood blocking or nailer on steel framing shall be bolted thereto. Provide solid grounds blocking in walls for wall hung or attached items and equipment (i.e. cabinets, countertop brackets and supports, wall mounted hardware, coat hooks, toilet accessories, etc.) Also provide wood blocking in walls and/or ceilings for all owner-provided items. Verify and coordinate with owner actual locations.

C. Nails, spikes, screws and other anchoring items shall be of the approved size and type to secure the member in place if not called out on drawings.

D. If approved by Architect, fir dimensional lumber and fir plywood may be used in lieu of pressure treated wood in concealed areas unless pressure treated wood is required by code. If pressure treated wood is used, secure with 304 or 316 stainless steel fasteners or other corrosive-resistant fasteners approved for use with pressure treated wood and approved by manufacturer. Install 30# felt paper over metal substrates or coat with bituminous material prior to installation of pressure treated wood products.

E. Metal products in contact with pressure-treated wood must be corrosion resistant. Examples include flashing, termite shields, fasteners (e.g. nails, screws, and bolts), and all connecting hardware (e.g. joist hangers, straps, hinges, post anchors, and truss plates). Provide non corrosive separation material between such as felt paper, bituminous material, etc.

F. Defective materials shall be removed from the job site and replaced with acceptable materials at no additional cost to the Owner.

3.2 PROTECTION OF INSTALLED PRODUCT

A. Any exposed exterior or interior plywood sheathing to be covered with temporary or permanent weather barrier within 24 hours following sheathing installation to prevent exposure to moisture or sunlight.

3.3 GRADE STAMPS

A. Framing lumber: Identify all framing lumber by the grade stamp of the Southern Pine Inspection Bureau.

B. Plywood: Identify all plywood as to species, grade, and glue type by the stamp of the American Plywood Association.

C. Other: Identify all other materials of this Section by the appropriate stamp of the agency listed in the reference standards.

3.4 CLEAN UP

A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the work. Clean up and remove from site the debris, cut ends, and sawdust.

END OF SECTION

SECTION 06 20 23

FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install items of finish carpentry including all finish trim; fitting and installing all wood doors; installing all finish hardware, and construction of job-built shelving.

1.2 RELATED WORK

A. Section 06 10 00 - Rough Carpentry

B. Section 08 14 16 - Wood Doors

C. Section 08 71 00 - Finish Hardware

D. Section 08 81 00 - Glass and Glazing

E. Section 09 91 00 – Finishes

1.3 REFERENCES

A. Comply with ADA Accessible Guidelines in regard to accessible or handicapped features.

1.4 FIELD DIMENSIONS & COORDINATION

A. The Owner’s millwork manufacturer is responsible for details and dimensions set in accordance with field measurements.

B. Coordinate clearances of door hardware items with lites and lite frames.

PART 2 PRODUCTS

2.1 FINISH WOOD MATERIALS:

A. When painted, material shall be close grained, smooth surface, suitable for painting. Species to be Poplar or other similar closed grain species with Architect's approval.

B. All materials shall be of select material, with no splits, knots, or other defects.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Frame, fit closely, and set accurately to required lines, levels, and secure rigidly in place.

3.2 FINISH HARDWARE: See Section 08 71 00.

A. Installation only by this section. Cut, fit, and install without marring or injuring work. Examine hardware at completion of work; test, oil, grease, adjust, and perform all necessary work to insure correct operation.

B. Doorknobs, pulls, kick plates, push plates, etc., are to be fitted and installed before finishing, then removed and re- installed after finish work is completed.

3.3 WOOD DOORS: See Section 08 14 16

A. Installation only under this section. Fit, hang, trim as required.

B. Provide the following clearances:

Sides	1/16"
Top	1/16"
Base (with threshold)	3/16"
Base (without threshold)	3/8 "

C. Install hardware as specified. Locksets and latches to have centers at 38" above finish floor unless otherwise stated. Coordinate location of locks with approved Hardware Schedule.

END OF SECTION

SECTION 07 01 50

ROOF PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Patching of TPO roofing system.

1.2 RELATED SECTIONS

A. Section 01 11 00: Summary of Work

B. Section 01 73 29: Cutting and Patching

C. Section 01 35 16: Alteration Project Procedures

D. Section 02 41 19: Minor Demolition

E. Section 07 62 00: Sheet Metal Flashing & Trim

1.3 QUALITY ASSURANCE

A. Roofing Installer: Company specializing in membrane roof application approved by the roofing materials manufacturer specified and who has been installing roofs for at least 5 years.

1.4 PROJECT/SITE CONDITIONS

A. Environmental Requirements;
   1. Do not apply roofing membrane during inclement weather or when air temperature may fall below 40 degrees F.
   2. Do not apply roofing membrane to damp or frozen deck surface.
   3. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weather-proofed during same day.

B. Coordinate the work with affected mechanical and electrical work associated with roof penetrations.

1.5 MANUFACTURER'S GUARANTEE

A. Roofing installer will perform patching of roof system in a manner approved by the existing roofing manufacturer so that patching will not void warranty of existing roof system.

B. Submit proof to Architect's office prior to beginning work that current roof warranty will continue and applicator is certified by roof system manufacturer.

C. Provide two year warranty covering all materials and workmanship for a period of two years for the areas of repair and/or modification. See sample guarantee form at end of this specification.

PART 2 PRODUCTS

2.1 ROOF MEMBRANE

A. If not specified or noted on the plans, the roofing installer is to determine existing roofing membrane and match type and finish.

B. Use only the flexible membrane flashing materials that are recommended by the roofing manufacturer. Written documentation required before acceptance.

2.2 INSULATION AND RECOVERY BOARD

A. Where rigid roof insulation board is to be replaced or patched, provide faced isocyanurate insulation board of thickness as required to match existing insulation thickness. Mechanically fasten to existing roof deck. Provide tapered where shown or as required.

B. Where recovery board is to be replaced, provide minimum 1/2" high pressure fiberboard. Mechanically attach to existing roof deck.

C. Insulation board and recovery board to be approved by roofing membrane manufacturer and be compatible with roofing system.

2.3 ACCESSORIES

A. Roofing Fasteners: Galvanized or non-ferrous type, size, and style as required to suit application.

B. Mechanical Fasteners for Insulation: Appropriate to purpose intended and approved by Factory Mutual; length required for thickness of material; with metal washers. Type as required to fastening into existing roof deck.

2.4 Warranty manufacturer to approve all patching materials prior to installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing roof surface in areas to be patched or repaired is clean and smooth, free of depressions, waves, or projections.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips, nailing strips, and reglets are in place.

C. Verify deck is in satisfactory condition, is supported and tightly secured.

D. Verify existing roof surfaces are dry and free of snow or ice. Confirm dry surface by moisture meter with 12 percent moisture maximum. Provide documentation of moisture test.

3.2 PREPARATION

A. Protect building surfaces against damage from roofing work.

B. Temporary Protection: Sheet polyethylene, fiber reinforced. Provide weights to retain sheeting in position.

C. Remove flashings, roofing gravel, membrane and insulation if needed in preparation for new protected membrane roof patching system.

D. Repair any damaged or rotting deck in area of patch or repair prior to patching.

3.3 INSTALLATION

A. Roofing membrane system, insulation, and recovery board to be installed per manufacturer's instruction and be compatible with existing roofing. Install flashings as shown on drawings and per manufacturer's instructions.

B. Prefinished curbs, flashings, and sealant to be installed per manufacturer's instructions.

3.4 WEATHERTIGHTNESS

A. All patching work on existing roof systems to be performed to provide weathertight seal in patched areas.

3.5 ROOF SPLICES

A. All splices shall be made with materials supplied for this purpose by the manufacturer.

3.6 CLEANING

A. Remove bituminous markings from finished surfaces. In areas where finished surfaces are soiled by asphalt or any other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instruction.

B. Replace defaced or disfigured finishes caused by Work of this Section.

3.7 SCHEDULE

A. Patch all areas disturbed during re-flashing, mechanical or electrical work, or other areas needing repair as shown on drawings. Match surface conditions. Architect to inspect and approve all work and entire roof surface prior to acceptance.

END OF SECTION

COMPANY LETTERHEAD

CERTIFICATE OF GUARANTEE FROM INSTALLER

We, _____
(Name of Company or Contractor)
agree to maintain the roofing and flashing on the below mentioned building for the period indicated. This agreement is to render the roof and the flashing waterproof subject to the conditions outlined below.

OWNER OF BUILDING _____

Location of Building _____

City_____Roof Area_____ square feet_____

This Guarantee effective this_____ day of _____, 20_____, for the term of two (2) years from this date, provided any defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that we will not be responsible for leaks in the roofing or flashing due to excessive winds, distortion of the foundation on which the roofing rests, excessive hail storms, or any other conditions over which we have no control.

Signed _____
Name of Company

By _____

Position _____

Company is a _____
Corp./Partnership/Individual

NOTARY PUBLIC _____

Registered in the State of _____

SEAL

NOTE: Standard Fifteen (15) year unlimited dollar coverage warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - **NO EXCEPTIONS.**

SECTION 07 10 00

WATERPROOFING AND DAMPPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials to complete waterproofing and dampproofing shown and specified.

B. Section Includes:
   1. Horizontal joint waterproofing
   2. Expansion joint fillers
   3. Cavity wall flashing system
   4. Below-slab vapor barrier

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete

B. Section 04 22 00 – Concrete Unit Masonry

C. Section 07 62 00 – Flashing and Sheet Metal

D. Section 07 95 13 – Expansion Joint Covers

E. Section 09 29 00 – Drywall-Sheathing

1.3 SUBMITTALS

A. Comply with Section 01 33 00.

1.4 WARRANTY

A. The Contractor must guarantee all materials and workmanship for a minimum period of two (2) years from the date of Substantial Completion of the building unless longer warranty periods are specified for individual specified products.

B. The Contractor will, at any time within the two (2) year period, remedy all leaks of any nature in any part of the building due to the use of faulty materials and/or workmanship, without additional cost to the Owner. The Contractor shall further reimburse the Owner for any damage occasioned by such leaks.

C. The Contractor is cautioned to supplement the work, described in this section of the specifications, by any means necessary to permit the above guarantee, which he will be called upon to make as an obligation of the Contract.

1.5 PRE-INSTALLATION MEETING

A. The Contractor will schedule and conduct a pre-installation meeting for the following items:
   1. Cavity wall flashing system
   2. Under slab moisture barrier

B. The following shall be in attendance:
   1. Contractor
   2. Architect
   3. Product supplier and or manufacturer's representative
   4. Installer

PART 2 PRODUCTS

2.1 MATERIALS:

A. Horizontal expansion joint waterproofing of exterior slabs or slabs on grade: Tremco Vulkem #45 SSL Sealant as manufactured by Tremco, W.R. Meadows, Inc., or approved alternate. Color to be coordinated with Architect.

B. Horizontal expansion Joint Filler: Asphalt impregnated expansion joint material. Provide "Zip Strip" type filler so that top ½" can be removed for sealant installation.

C. Vertical Expansion Joint Filler: 'Colorseal' (width as required), manufactured by Emseal Joint Systems, LTD (800) 526-8365. No substitutions will be accepted. Architect to select color from standard and special color selections.

D. Cavity wall flashing system:
   1. Cavity Wall Flashing System:
      a. Through-Wall Flashing: Flex-Flash flashing polyester scrim reinforced, minimum 40-mils thick, self-adhering, pressure sensitive clear no drool adhesive membrane formulated with Dupont "Evaloy" Kee, manufactured by Holmann & Barnard, Inc.. Provide with all available preformed shapes (i.e. corners, level changes, end dams, stop ends, etc.) as needed to fit job conditions. Apply Primer-SA by HB where installed on exterior sheathing and/or CMU.
      b. Drainage & Vents: Mortar Net Drainage & Vent System or Mortar Trap & Weep Vent by HB.
      c. Termination Bar: Provide continuous aluminum or stainless-steel termination bar where membrane terminates on wall sheathing or substrate. Secure to substrate with screws meeting manufacturer detailing.
      d. Drip Edge: Not required. Terminate membrane flashing at front masonry edge. Flex-flash should be extended beyond the wall face and cut flush with the brick.
      e. Sealant: Provide sealant at termination bar and where thru wall flashing ends overlap, inside and outside corners and any other type of soft joints. Verify compatibility of sealant with any adjacent materials. HB Sealant, Dow Corning 790 & 791 with 1200 prime coat. Silaflex-1A with #260-205 primer or Sonolastic NPI with #733 primer.

2. Alternate manufacturers with equal or better product may submit product data to Architect for approval, following requirements of Section 01 60 00.
    a. "TotalFlash" system by Mortar Net USA Ltd, is an approved alternate system, Drainage and weep vents must be provided in addition to the built-in drainage mat.

E. Weep and VentilationVents:
1. QV- Quadro Vent by HB, or Weepvent by Mortar Net, ½" thick, size as required to match brick or CMU veneer head dimension.
2. Install at 24" o.c. horizontally for brick veneer, 32 o.c. horizontally for CMU veneer.
3. Provide ventilation vents at top of wall in same location and centering as weep vents.
4. Confirm Color with Architect for each masonry color used.

F. Mortar Collection Material:
1. Mortar Trap by HB, or MortarNet by Mortar Net, or approved alternate.
2. Thickness as required to fill cavity. Install just above thru-wall flashing in cavity at bottom of walls and above window and door openings per manufacturer's instructions.

G. Underslab Moisture Barrier: 15 mil thick virgin polyethylene, Approved Products and Manufacturers:
- Yellow Guard 15 mil vapor barrier, Manufactured by Husky
- "Perminator" under-slab vapor mat manufactured by W.R. Meadows, 15 mil thick
- "Stego Wrap Class A", manufactured by Stego Industries, Inc., 15 mil thick
- "EXTREME" manufactured by Textrude, Class A",
- W.R. Meadows (Perminator), Vaporblock
- VB15, manufactured by Raven Industries,
- Viper "Vaporcheck II" 15 mil class A vapor barrier, manufactured by Insulation Solutions, Inc., or approved alternate.

1. Use High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4 inches. Sealing tape shall be coated with a high tack natural rubber adhesive.
2. Waterproofing adhesive or mastic equal to Stego Mastic shall be a high quality, long lasting, asphalt-based material and shall be applied in accordance with its manufacturer's specification. Waterproofing adhesive shall be compatible for use with the vapor barrier and shall meet the applicable standards for the intended use. The installation contractor shall submit the product specification for Architect's review and approval prior to using the product.
3. References
    a. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
    b. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
    c. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
    d. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
    e. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
4. American Concrete Institute (ACI):

a. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

5. Vapor barrier must have all of the following qualities:
   a. Permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with ASTM E 1745 Section 7.
   b. Other performance criteria:
      i. Strength: ASTM E 1745 Class A.
      ii. Thickness: 15 mils minimum
6. Quality control/assurance (Submit the following for Architect's approval):
   a. Summary of test results as per paragraph 8.3 of ASTM E 1745.
   b. Manufacturer's samples, literature.
   c. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.

H. Refer to Section 07 19 00 for brick damp-proofing.

PART 3 EXECUTION

3.1 WORKMANSHIP:

A. Horizontal expansion joint waterproofing:
   1. All horizontal expansion joints shall be 1/2 inch asphalt impregnated expansion joint material with "zip-strip" feature. Insulation-type material will not be acceptable. Install to provide 1/2"depth below finish surface and apply sealant as called for above.

B. Expansion joint Filler:
   1. All vertical expansion joints shall be 1/2 inch asphalt impregnated expansion joint material. Not Insulation. The top 1/2 inch of material shall be omitted and joint filled with caulking as specified in Section 07 92 00. All caulking shall be installed flush with wall surface.

C. Cavity Wall Flashing System:
   1. The installer shall be knowledgeable of system installation. Contractor to have product representative on site when installation begins to verify correct installation procedures are being performed.
   2. Contractor to inspect each installed section of flashing system and approve before covering with veneer.
   3. Install Flashing/Drainage System in accordance with manufacturer's installation instructions.
   4. Install cavity wall flashing system at base of exterior masonry cavity walls and above doors and window openings where located in exterior masonry cavity walls and where shown on drawings. Extend flashing flush with outside face of masonry veneer.
   5. Prior to installation of wall flashing, prime substrate where wall flashings are to be installed with product approved by manufacturer.
   6. Where installed at CMU walls, secure with continuous galvanized metal or stainless steel termination bar and set in adhesive.

7. Install preformed shapes at corners, changes in elevation, etc. provide end dams and end stops where required per manufacturer's instruction. Provide preformed transitions where transitioning from grade to top of walk or drive.
8. Replace any damaged membrane prior to installation of masonry veneer.
9. Coordinate installation in veneer with weeps and drainage material.
10. At brick veneer cavity walls, grout solid below grade, turn out at bed joint at least one brick course below finished floor, or 4". Install above all door openings at masonry cavity walls and where shown on drawings.
11. Just prior to laying of masonry veneer, install mortar collection material.
12. Install weep joints at brick head joints, 24" o.c. (horizontally).

D. Below-Slab Vapor Barrier (15 mil below-slab):
1. Prepare surfaces in accordance with manufacturers instructions.
2. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643. All lap joints and areas to be sealed shall be free from dirt, dust, and moisture. Sealing tape shall be applied in temperatures ranging from 41°F to 122 °F or according to its manufacturer specification. Where inconsistencies occur between the project plans and specification and ASTM E1643, the project plans and specification shall govern.
3. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
4. Lap vapor barrier over footings and seal to foundation walls or top of footings with manufacturer approved sealant.
5. Overlap joints 6 inches and seal with manufacturer's tape.
6. Seal all penetrations (including pipes) with manufacturer's pipe boot and sealant.
7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.
9. Pipe/Conduit Boots and Penetration Sealing:
   a) Cut a piece of vapor barrier. Width: minimum 12 inches Length: one and one-half times the pipe circumference
   b) With scissors, cut slits half the width of the vapor barrier.
   c) Wrap boot around pipe and tape onto pipe, completely taping the base to vapor barrier using the polyethylene tape.
   d) Install mastic around and through groups of conduit, grade stakes or piping, which cannot be sealed by taping. Seal to vapor barrier. As an allowable alternate method of penetration sealing in lieu of taping, mastic may be used to seal around single penetrations such as pipe, conduit, floor drains, etc. Confirm that the material mastic is installed at is compatible with the mastic prior to application.
10. Seal vapor barrier to top of footings with mastic where vapor barrier terminates at perimeter or interior footings. When vapor barrier terminates at concrete or CMU walls, seal with mastic. Do not apply mastic above top of finished slab elevation.

E. Vertical Expansion Joint Filler: Protect from adjacent finish application. Prep substrate and install per Emseal instruction for application in which it is being installed.

END OF SECTION

SECTION 07 19 00

WATER REPELLENT COATING

PART I GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water repellent coating to exterior masonry surfaces.

B. Related Sections:
   1. Section 04 21 13 - Brick Masonry

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.3 QUALITY ASSURANCE

A. Applicator: Acceptable to coating manufacturer.

B. Field Sample: Apply coating to field sample described for material water repellent is to be applied to.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Follow manufacturer's recommendations for temperature range in which coating may be applied.

B. Comply with National Volatile Organic Compound Emission Standards for Architectural coatings, Rule 40 CFR, Part 59, established by Environmental Protection Agency for VOC limits unless stricter local regulations are required.

1.5 GUARANTEE/WARRANTY:

A. Provide 10-year warranty for water repellent coating on brick, guaranteeing the installation waterproof and watertight, except for structural cracks or opening caused by settling, expansion or contraction.

B. Warranty Period: 10 years from date of Substantial Completion. Non-prorated labor and materials.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER/PRODUCT

A. Brick application:
   1. Siloxane WB Concentrate by ProSoCo.
   2. Prime-a-Pell 200. Manufacturer: Chemprobe Corporation.

2.2 SUBSTITUTIONS

A. Refer to Specification Section 01 60 00 for product substitution requests.

B. No substitution will be accepted 10 days prior to bid date.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify joint sealants are installed and cured.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Remove loose particles and foreign matter.

B. Remove oil or foreign substance with a cleaning agent which will not affect coating.

C. Scrub and rinse surfaces with water and let dry.

D. Protect adjacent surfaces not scheduled to receive coating.

E. If applied on unscheduled surfaces, remove immediately, by approved method.

F. Protect landscaping, property, and vehicles from over spray and drift.

3.3 APPLICATION

A. Delay work until masonry mortar is cured for seven days and weather forecast calls for hot, dry conditions. Follow manufacturer’s directions for masonry cure periods before applying water repellent.

B. Apply coating **(minimum 2 coats)** in accordance with manufacturer's instructions, using appropriate method and coverage rate.

C. Application:
   1. Surface must be clean and dry.
   2. Air temperature must be 50° F or higher during application.
   3. Re-pointing shall be allowed to dry for 72 hrs. minimum before application.
   4. All caulking and sealant work must be done prior to application and have a minimum of 12 hours of curing time or until set.
   5. All alkali or effloresence to be cleaned and/or treated prior to application.
   6. Material to be applied with a 12” rundown.
   7. Mask off other finish materials, aluminum storefronts, windows, glass,etc. that are not scheduled to receive water repellent coating.
   8. Coverage must meet or exceed normal coverage rates stated by the manufacturer.
   9. Application may be low pressure sprayer (less than 200 psi or lower as recommended by manufacturer.,

END OF SECTION

SECTION 07 21 00

INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment, and services necessary for and reasonably incidental to complete insulation as called for below.

1.2 REFERENCE STANDARDS

A. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions; 2018.
B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2016.
C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011.

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.
B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
C. NFPA 285 Compliance: Submit documentation showing wall assembly compliance with NFPA 285.

1.4 QUALITY CONTROL

A. All packages and containers of foam plastic and foam plastic ingredients shall bear the label of an approved agency showing either the flame spread rating and smoke developed rating of the product at the thickness tested or the use for which the product has been listed.

B. Results of diversified or full scale fire tests reflecting an end use configuration shall be submitted to the Building Official demonstrating the assembly in its final form does not propagate flame over the surface or through the core when exposed on the exterior face to a fire source.

C. The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number of definitive information describing the product or materials performance characteristics and approved agency's identification.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Rigid Fiberglass Insulation Board
1. Type 703 (3.0 PCF) and type 705 (6.0 PCF) manufactured by Owens Corning, or approved alternate. Refer to drawings for insulation thickness and density locations.

B. Sound Attenuation Batts: 3 1/2" thick, un-faced fiberglass “Sonobatts”, manufactured by Owens Corning, or approved alternate.
1. Provide sound attenuation batts in all interior stud walls.
2. Refer to drawings and finish schedule notes for other areas where sound attenuation batts are called for.

B. Rigid Cavity Wall Insulation -Extruded Polystyrene Board: ASTM C578
1. Basis of Design:
a. DuPont de Nemours Inc. ; **DuPont™ Styrofoam™ Brand Cavitymate™ Plus Extruded Polystyrene Insulation***: building.dupont.com/commercial.
b. Approved Alternate
2. Type: ASTM C578, Type IV - 25 PSI.
3. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
5. R-value: 1 inch of material at 72 degrees F: 5 minimum.
6. Panel Size: 2 inches thick by 16" wide by 96" long.
7. Board Edges: Square.
8. Recycled Content: Average of 20% pre-consumer certified by UL Environment Inc.
9. Water Absorption: ASTM C272, 0.1% max, by volume.

C. Flexible fiberglass metal building insulation: Refer to Pre-Engineered Metal Building Specification Section

I. Rigid Roof Insulation: Refer to individual roofing sections for description or insulation.

2.2 ACCESSORIES FOR RIGID CAVITY WALL INSULATION

A. Penetration and Gap Filler
1. DuPont™ Great Stuff Pro
2. Approved alternate as a recommended by manufacturer

B. Exterior Insulation Joint Treatment (Optional)
1. DuPont™ LiquidArmor Flashing and Sealant
2. Approved alternate as a recommended by manufacturer

C. Board Insulation Bonding Adhesive: Provide product as recommended by insulation manufacturer that will not damage insulation or substrates.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Fiberglass wall insulation and sound attenuation batts shall be friction fit, with electrical conduits and water piping held to the interior face side of the wall. When unfaced insulation is used, and in applications without a cover material or where the stud depth is larger than the insulation thickness, use wire or metal straps to hold insulation in place, maximum spacing 2'-0" o.c. Install tight to sides of studs.

C. Rigid Cavity Wall Insulation
   1. Install tight to substrate. Panels are secured in place with wall tie system. Refer to Section 04 22 00 for masonry wall tie product information.
   2. Apply adhesive to boards:
      a. Apply 2" diameter daubs of adhesive spaced approximately 12" o.c. both ways on inside face of insulation board.

B. Install boards to fit snugly between wall ties and other obstructions with edges butted tightly.

B. Install boards horizontally lengthwise on walls, staggering the joints.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   1. Seal around penetrations using Penetration and Gap Filler material.
   2. Maintain continuity of air barrier by sealing the roof/wall juncture with Roof/Wall Juncture Sealing material.

3.2 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED WEATHER BARRIER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Work of this section includes door flashing, air and water-resistive barrier membrane system, and accessory materials for application to exterior building envelope substrates unless indicated otherwise on the drawings and specifications.

B. Related work:
   1. 04 22 00 - Concrete Unit Masonry
   2. 06 10 00 – Rough Carpentry
   3. 07 62 00 - Sheet Metal flashing
   4. 07 92 00 - Joint Sealants
   5. 08 11 13 - Hollow Metal Doors & Frames

1.2 PERFORMANCE REQUIREMENTS

A. Performance requirements: Comply with the specified performance requirements and characteristics as herein specified.

B. Performance description:
   1. The building envelope shall be constructed with a continuous, air and water-resistive barrier to control water and air leakage into and out of the conditioned space.
   2. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
   3. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the envelope without damage or displacement.
   4. System shall be installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations.

1.3 SUBMITTALS

A. Product data: Submit manufacturer’s product data including membrane and accessory material types, technical and test data, composition, descriptions and properties, installation instructions and substrate preparation requirements.

B. Shop Drawings: Provide Installation Guideline Illustrations.

1.4 QUALITY ASSURANCE

A. Applicable standards, as referenced herein: ASTM International (ASTM).

B. Manufacturer’s qualifications: Air and water-resistive barrier systems shall be manufactured and marketed by a firm with a minimum of five (5) years experience in the production and sales of air and water-resistive barrier system. Manufacturers proposed for use, but not named in these specifications, shall submit evidence of ability

to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

C. Installer's qualifications: The installer shall demonstrate qualifications to perform the work of this section by submitting the following:
   1. Verification that installer has been trained by and is approved to perform work as herein specified by air and water-resistive barrier system manufacturer.
   2. A firm experienced in applying similar materials on similar size and scoped projects.
   3. Evidence of proper equipment and trained field personnel to successfully complete the project.

D. Inspection and testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover installed products or assemblies until they have been inspected, tested and approved.

E. Sole source: Obtain materials from a single manufacturer.

F. Regulations: Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOC).

G. Pre-installation conference: Prior to beginning installation of air and water-resistive barrier system, hold a pre-installation conference to review work to be accomplished.
   1. Contractor, Architect, installing subcontractor, membrane system manufacturer's representative, and all subcontractors who have materials penetrating membrane system or finishes covering membrane system shall be present.
   2. Contractor shall notify Architect at least seven days prior to time for conference.
   3. Contractor shall record minutes of meeting and distribute to attending parties.
   4. Agenda: As a minimum discuss:
      a. Surface preparation.
      b. Substrate condition and pretreatment.
      c. Minimum curing period.
      d. Special details and sheet flashing.
      e. Sequence of construction, responsibilities, and schedule for subsequent operations.
      f. Installation procedures.
      g. Inspection procedures.
      h. Protection and repair procedures.
      i. Review and approval of all glazing applications.
   5. Applicator to prepare a mockup of system at an opening, showing all aspects of the weather barrier system.

H. Mock-up:

1 Prior to installation of the weather and air barrier system a field-constructed mock-up shall be applied to verify details and tie-ins, to demonstrate the required installation.

a. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window, door frame, sill, penetrations, insulation, flashing and any other critical junction.

b. Allow 72 hours for inspection and testing of mock-up before proceeding with weather and air barrier work.

c. Approved, undamaged mock-up must remain as part of the work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Protect air and water-resistive barrier components from freezing and extreme heat.

C. Sequence deliveries to avoid delays, and to minimize on-site storage.

1.6 PROJECT CONDITIONS

A. Weather conditions: Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.
   1. Apply at surface and ambient temperatures recommended by the manufacturer. See manufacturer's product data sheets for best practices.
   2. Proceed with installation only when the substrate construction and preparation work are complete and in condition to receive the membrane system.
   3. Exposure limitations: Schedule work to ensure that air and water-resistive barrier system is covered and protected from UV exposure within 180 days of installation. If air and water-resistive barrier membrane system cannot be covered within 180 days after installation, apply temporary UV protection as recommended by membrane manufacturer.

1.7 WARRANTY

A. Manufacturer's warranty requirements: Submit manufacturer's written warranty stating that installed air and water-resistive barrier materials are watertight, free from defects in material and workmanship, and agreeing to replace defective materials and components.

B. Warranty period: Five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. PROSOCO, Inc, 3741 Greenway Circle, Lawrence, KS 66046. Phone (800) 255-4255; Fax: (800) 877-2700. E-mail: CustomerCare@prosoco.com

B. Approved Alternate: AirShield TMP, manufactured by W.R. Meadows (800)-342-5976

C. Substitutions: Comply with Section 01 60 00.

2.2 R-GUARD JOINT & SEAM FILLER FIBER REINFORCED FILL COAT AND SEAM FILLER

A. Acceptable product: PROSOCO R-GUARD® Joint & Seam Filler or equivalent by W.R. Meadows.

B. Description: Joint & Seam Filler is a high modulus, gun-grade, crack and joint filler, adhesive and detailing compound that combines the best silicone and polyurethane properties. This single-component, 99% solids, fiber-reinforced, Silyl-Terminated-Poly-Ether (STPE) is easy to gun, spread and tool.

C. Characteristics:
1. Thickness: Apply according to manufacturer's instructions. See product data sheet.
2. Hardness: Shore A, 45-50 when tested in accordance with ASTM C661.
3. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E-96.
4. Tensile strength: 225 psi when tested in accordance with ASTM D412.
5. Lap shear strength: 275 psi when tested in accordance with ASTM D1002.
6. Elongation at break: 275% when tested in accordance with ASTM D412.
7. Peel strength: 30 pli when tested in accordance with ASTM D1781.
8. Shrinkage: None.
9. Form: pale red, gun-grade sealant
10. Specific gravity: 1.40 to 1.50
11. pH: not applicable
12. Weight per gallon: 11.8 pounds
13. Active content: 99 percent
14. Total solids: 99 percent
15. Volatile organic content (VOC): 30 grams per Liter, maximum
16. Flash point: no data
17. Freeze point: no date
18. Shelf life: 1 year in tightly sealed, unopened container

2.3 R-GUARD FASTFLASH® LIQUID-APPLIED FLASHING MEMBRANE

A. Acceptable product: PROSOCO R-GUARD® FastFlash® or equivalent by W.R. Meadows.

B. Description: FastFlash® is a gun-grade waterproofing, adhesive and detailing compound that combines the best of silicone and polyurethane properties. This single component, 99% solids, Silyl-Terminated-Poly-Ether (STPE) is easy to gun, spread and tool to produce a highly durable, seamless, elastomeric flashing membrane in rough openings of structural walls.

C. Characteristics:
1. Thickness: Apply according to manufacturer's instructions.
2. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E96.
3. Water penetration (cyclical static air pressure difference): No uncontrolled water penetration when tested in accordance with ASTM E547.
4. Hardness: Shore A, 40-45 when tested in accordance with ASTM C661.
5. Tensile strength: 180 psi when tested in accordance with ASTM D412.
6. Elongation at break: 400% when tested in accordance with ASTM D412.
7. Peel strength: 25 pli when tested in accordance with ASTM D1781.

8. Form: Brick Red, Gun Grade Sealant.
9. Specific gravity: 1.45 to 1.60
10. pH: not applicable
11. Weight per gallon: 12.5 pounds
12. Active content: 99 percent
13. Total solids: 99 percent
14. Volatile organic content (VOC): 30 grams per Liter, maximum
15. Flash point: no data
16. Freeze point: no data
17. Shelf life: 1 year in tightly sealed, unopened container

2.4 R-GUARD SPRAY WRAP MVP (MAXIMUM VAPOR PERMEABILITY) AIR AND WATER-RESISTIVE BARRIER

A. Acceptable product: PROSOCO R-GUARD® MVP or AirShield LMP, manufactured by W.R. Meadows

B. Description: SPRAY WRAP MVP is a fluid-applied air and water-resistive barrier that stops air and water leakage in cavity wall, masonry veneer construction. Once on the substrate, the easily applied liquid quickly dries into a rubberized, highly durable, water-resistant, vapor-permeable membrane.

C. Characteristics:
1. Thickness: Apply in accordance with manufacturer's instructions. See product data sheet.
2. Air infiltration: Less than 0.004 cfm per square foot (0.02 L/s/sq m) when tested in accordance with ASTM E2178 or ASTM E283.
3. Air Barrier Assembly: pass when tested in accordance with ASTM E2357.
4. Water vapor permeability: Minimum 17 perms when tested in accordance with ASTM E96.
5. Structural performance: Air and water-resistive barrier system shall withstand positive and negative wind pressure loading when tested in accordance with ASTM E330.
6. Water penetration (static pressure): No uncontrolled water penetration when tested in accordance with ASTM E331.
7. Tensile strength: Greater than 15 psi or exceeds strength of substrate when tested in accordance with ASTM C297.
8. Nail Sealability: pass when tested in accordance with ASTM D1970.
9. Flexibility: pass when tested in accordance with ASTM D522.
10. Form: thin, milky batter-like mixture
11. Specific gravity: greater than 1.31
12. pH: 7.5 to 10.0
13. Weight per gallon: 12.2 pounds
14. Active content: no data
15. Total solids: 68 to 72 percent by volume, ASTM-D-2369
16. Volatile organic content (VOC): less than 18 grams per Liter
17. Flash point: not applicable
18. Freeze point: 32 degrees Fahrenheit (0 degrees Celsius)
19. Shelf life: 2 years in tightly sealed, unopened container

2.5 R-GUARD AIRDAM® AIR AND WATERPROOF SEALANT FOR WINDOWS AND DOORS

A. Acceptable product: PROSOCO R-GUARD® AirDam®

B. Description: AirDam® is a medium modulus sealant that combines the best silicone and polyurethane properties. This single component, 98% solids Silyl-Terminated-Poly-Ether (STPE) is easy to gun and tool in all weather conditions. AirDam® cures quickly to produce a durable, high performance, high movement elastomeric interior air sealant

C. Characteristics:
   1. Hardness: Shore A, 20-25 when tested in accordance with ASTM C661.
   2. Tensile strength: 110 psi when tested in accordance with ASTM D412.
   3. Elongation at break: 1300% when tested in accordance with ASTM D412.
   4. Peel strength: 30 pli when tested in accordance with ASTM D1781.
   5. Type: Type S, Grade NS, Class 50 when tested in accordance with ASTM C920.
   6. Shrinkage: None.
   7. Form: heavy white paste, mild odor
   8. Specific gravity: 1.3 to 1.4
   9. pH: not applicable
   10. Weight per gallon: 11.648 pounds
   11. Active content: 98 percent
   12. Total solids: 98 percent
   13. Volatile organic content (VOC): 30 grams per Liter, maximum
   14. Flash point: greater than 200 degrees Fahrenheit (greater than 93 degrees Celsius)
   15. Freeze point: not applicable
   16. Shelf life: 1 year in tightly sealed, unopened container

D. Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify design professionals in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.

B. All surfaces must be sound, clean and free of grease, dirt, excess mortar or other contaminants. Fill or bridge damaged surfaces, voids or gaps larger than one-half (1/2) inch with mortar, wood, metal, sheathing or other suitable material, as necessary. Fill voids and gaps measuring one-half (1/2) inch or less with R-GUARD Joint & Seam Filler as necessary to ensure continuity.
   1. Surfaces to receive R-GUARD MVP may be dry or damp. Do not apply to surfaces which are sufficiently wet to transfer water to the skin when touched. Surfaces must be protected from rain for 2 hours following application.
   2. Surfaces to receive FastFlash®, Joint & Seam Filler, and AirDam® may be dry, damp or wet to the touch. Brush away any standing water which may be present before application.

C. Where curing materials are used they must be clear resin based without oil, wax or pigments

D. Condition materials to room temperature prior to application to facilitate extrusion and handling.

E. Prior to installation of veneer at cavity wall construction with CMU backup, apply fluid-applied moisture barrier on all walls where concealed behind masonry veneer where a cavity is created unless called out otherwise.

3.2 SURFACE PREPARATION

A. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
   1. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
   2. Remove contaminants such as grease, oil and wax from exposed surfaces.
   3. Remove dust, dirt, loose stone and debris.
   4. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
   5. The PROSOCO R-GUARD® product line includes several options for preparing structural walls to receive the primary air and water resistive barrier. Refer to manufacturer's product data sheets and R-GUARD Installation Guidelines for additional information.

B. Masonry substrates:
   1. Mortar joints on concealed areas where fluid applied cavity wall weather barrier is to be applied must be fully filled with no voids, holes, or cracks, struck flush with the face of CMU.
   2. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and debris.

3.3 INSTALLATION OF JOINT TREATMENT (PREPARE)

A. Before applying complete weather barrier system, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for PROSOCO R-GUARD® MVP. Refer to the Product Data Sheet for additional information about application.

B. Apply R-GUARD Joint & Seam Filler for seams, joints, cracks, gaps, rough openings:
   1. Fill or repair cracks larger than one-half inch.
   2. Fill surface defects and over driven fasteners with R-GUARD Joint & Seam Filler.
   3. Using a dry knife, trowel or spatula, tool and spread the product. Spread one inch beyond seam at each side to manufacturer's recommended thickness. See product data sheet.
   4. Allow to skin before installing other waterproofing or air barrier components.
   5. Apply in accordance with manufacturer's Application Guideline illustrations.

3.4 R-GUARD FASTFLASH® FLASHING AT DOORS, OPENINGS AND PENETRATIONS (PREPARE)

A. Apply R-GUARD FastFlash® over surfaces prepared with R-GUARD Joint & Seam Filler to seal and waterproof rough openings:
   1. Apply a thick bead of R-GUARD FastFlash® over any visible gaps in the prepared rough opening.

2. Immediately press and spread the wet product into gaps.
3. Allow treated surface to skin.
4. Starting at the top, apply a thick bead of R-GUARD FastFlash® in a zigzag pattern to the structural wall surrounding the rough opening.
5. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply and spread additional product as needed to create an opaque, monolithic flashing membrane free of voids and pin holes.
6. Apply additional product in a zigzag pattern over a structural framing inside the rough opening.
7. Apply R-GUARD FastFlash® within temperature and weather limitations as required by manufacturer.
8. Apply R-GUARD FastFlash® to perimeters, sills and adjacent sheathing and building face, in accordance with manufacturer's product data sheet and R-GUARD Installation Guidelines illustrations.
9. Extend flashing onto building face 4 to 6 inches.
10. Install preparation products in accordance with manufacturer's Application Guideline illustrations.

3.5 R-GUARD AIR & WATER-RESISTIVE BARRIER INSTALLATION (PROTECT)

A. Apply appropriate R-GUARD air and water-resistive barrier to a clean, dry substrate within temperature and weather limitations as required by manufacturer.
   1. Apply to recommended thickness. Proper thickness is achieved when coating is opaque.
   2. Allow product to cure and dry.
   3. Inspect membrane before covering. Repair any punctures, translucent or damaged areas by applying additional material.
   4. Specifier Note: If air or surface temperature exceed 95 degrees Fahrenheit (35 degrees Celsius), apply to shaded surfaces and before daytime air and surface temperatures reach their peak.
   5. On CMU wall construction back roll as necessary to ensure there are no pinholes, voids or gaps in the membrane.

3.6 R-GUARD FLASHING TRANSITIONS (TRANSITION)

A. Apply R-GUARD Joint & Seam Filler and R-GUARD FastFlash® as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials.
   1. Fill any voids between the top of the flashing leg and the vertical wall with R-GUARD Joint & Seam Filler. Tool to direct water from the vertical wall to the flashing.
   2. Apply a generous bead of FastFlash® to the top edge of the flashing leg.
   3. Spread the wet products to create a monolithic "cap-flash" flashing membrane extending 2 inches up the vertical face of the structural wall and 1 inch over the flashing membrane extending. Apply additional product as needed to achieve a void and pinhole free surface. This "liquid termination bar" helps secure the flashing and ensures positive drainage from the wall surface to the flashing.
   4. Allow treated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.

3.7 R-GUARD AIRDAM® AIR AND WEATHER BARRIER SEALANT FOR DOOR INSTALLATION

A. Install R-GUARD AirDam® with professional grade caulking gun in continuous beads without air gaps or air pockets.
   1. Apply R-GUARD AirDam® to a clean, dry or damp surface
   2. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth
   3. Install AirDam® to provide uniform, continuous ribbons without gaps or air pockets, with complete wetting of the joint bond surfaces.
   4. Tool sealant immediately to ensure complete wetting of joint bond surface and to produce a smooth, concave joint profile flush with the edges of the adjacent surfaces. Where horizontal and vertical surfaces meet, tool sealant to create a slight cove so as to not trap moisture or debris.
   5. Do not allow materials to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
   6. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.

3.8 CURING AND DRYING

A. Complete drying times vary with temperature, humidity and surface conditions. Protect from rain or freezing until completely dry. At 70°F (21°C) and 50% relative humidity, R-GUARD MVP dries to touch and can be over coated in 2-4 hours.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC OLEFIN MEMBRANE ROOFING SYSTEM (TPO)

PART 1 GENERAL

1.1 SUMMARY

A. Furnish and install fully adhered elastomeric sheet roofing system over metal deck, including:
   1. Roofing manufacturer's requirements for the specified warranty.
   2. Preparation of roofing substrates.
   3. Insulation.
   4. Thermoplastic Olefin membrane roofing.
   5. Metal roof edging and copings.
   6. Flashings.
   7. Walkway pads.
   8. Roof drains
   9. Expansion Joint Covers
   10. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

B. Disposal of construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane manufacturer.

D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

B. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2004.

C. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2004.

D. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 2003.

E. ASTM D 1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2003.

F. ASTM D 1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2005a.

G. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2003.

H. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2003.

I. FM 1-28 - Design Wind Loads; Factory Mutual System; 2002.

J. FM 1-29 - Roof Deck Securement and Above Deck Roof Components; Factory Mutual System; 2005.

K. PS 1 - Construction and Industrial Plywood; 1995.

L. PS 20 - American Softwood Lumber Standard; 2005.

M. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1).

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in the section.

B. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC S770.

1.4 SUBMITTALS

A. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
   2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
   3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

   1. Flashings and membrane terminations.
   2. Insulation fastening patterns.
   3. Sheet layout with perimeter and corner defined.
   4. Expansion joints.

C. Samples: Submit samples of each product to be used.

D. Specimen Warranty: Submit prior to starting work.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

G. Membrane must be Energy Star rated.

1.5 QUALITY ASSURANCE

A. No private label products or products manufactured by second party are allowed.
   1. All roofing membrane products must be manufactured by Roofing Manufacturer.

B. Applicator Qualifications: Roofing installer shall have the following:
   1. Current GAF Master or Master Select Contractor status.
   2. At least five years experience in installing specified roofing system.
   3. Capability to provide payment and performance bond to building owner.

C. Contractor providing work under this section will install work specified in this section with their company's own installers, employed by the company. Subcontracting of installation will not be allowed.

D. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
   1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
   2. Notify Architect well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements:
   1. Do not apply roofing membrane during inclement weather or when air temperature may fall below 40 degrees F.
   2. Do not apply roofing membrane to damp or frozen deck surface.
   3. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weather proofed during same day.

1.8 ROOFING CONTRACTOR'S QUALIFICATIONS

A. Contractor shall submit written statement authorized by the roofing system manufacturer to be certified to install the specified manufacturer's materials and has been certified for two consecutive years.

B. The contractor shall use adequate amounts of such qualified workmen who are thoroughly trained in the crafts and techniques required to properly install the type of roofing system proposed for use and other work required to complete the work specified and within the specified time.

C. The contractor shall have a superintendent having five (5) years experience installing the roof system specified, who is familiar with the requirements of this project, on the job at all times when roofing system work is in progress.

1.9 ROOFING MANUFACTURER INSPECTION

A. Final inspection by roofing manufacturer's representative is mandatory prior to substantial completion. **Architect to be notified a minimum of 24 hours prior to manufacturer's inspection and be performed in his presence.**

B. Written proof of final inspection by roofing manufacturer's representative is to be included in closeout documents.

C. **It will be mandatory** that the final roof inspection report containing items to be corrected be sent to Architect for his records.

D. Upon date of Substantial Completion, a **No Dollar Limit Warranty** will be issued and begin for a Twenty (20) year period for the total system warranty. **No exceptions**.

1.10 PRE-ROOFING MEETING AGENDA

A. Verifying roof type and insulation thickness with roofing sub.

B. Warranty: 2 year-installer/ 20 year NDL-manufacturer

C. Manufacturer's scheduled inspection for warranty-Notification of Architect
   1. Warranty period does not start until date of Substantial Completion
   2. Distribution of inspection review to Architect

D. Areas of concern:
   1. Covering over top of parapet walls with roofing membrane
   2. Temporary sealing of roofing membrane against walls until parapet wall membrane flashing or reglets are installed
   3. Installation of welded sub-flashing pieces at parapet corners
   4. Installation of crickets at equipment curbs
   5. Turning up roofing membrane to top of equipment curbs.

6. Sealing of roof penetrations at membrane
7. Keeping roof clean after roofing is installed (trash, screws, nails, etc.)
8. Positive slope all areas
9. Expansion joints

E. Schedule of installation for each area of building.

1.11 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: GAF Diamond Pledge 20 -Year NDL Warranty covering membrane, roof insulation, and membrane materials and accessories.
   1. Limit of Liability: No dollar limitation.
   2. Scope of Coverage: Repair leaks in the roofing system caused by:
      a. Ordinary wear and tear of the elements.
      b. Manufacturing defect in GAF brand materials.
      c. Defective workmanship used to install these materials.
      d. Damage due to winds up to 55 mph (88 km/h).

C. Roof flashings, metal work and expansion joint covers shall be covered under installer's two (2) year warranty.

D. In addition to Mfg's Warranty, a Company 2-year Guarantee from the installer (included in this specification) shall be delivered to the Owner as a condition of Acceptance.

E. Roofer will provide a letter stating the roof system meets or exceeds 1-90 uplift design requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roofing System: GAF, Incl, Parsippany, NJ. www.GAF.com. (973-628-3884)
   1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
      a. Specializing in manufacturing the roofing system to be provided.
      b. Minimum ten years of experience manufacturing the roofing system to be provided.
      c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
      d. ISO 9002 certified.
      e. Able to provide isocyanate insulation that is produced in own facilities.
      f. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:
      g. Able to provide membrane that is produced in own facilities.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging:
   1. Metal roof edging products by manufacturers other than roofing manufacturer are acceptable but must be approved by roofing manufacturer.
   2. Field- or shop-fabricated metal roof edgings are acceptable but must be covered under the scope of the roofing membrane system no dollar limit warranty.

D. Acceptable alternate manufacturers (Must meet guideline requirements as specified this section)

   1. Johns Manville JM TPO, 717 17th Street, Denver, CO 80202 (800) 922-5922

   2. Carlisle Syntec Sure-Weld TPO, PO Box 7000, Carlisle, PA 17013, 800-479-6832

   3. Elevate .060 mil TPO, 26 Century Blvd., Nashville, TN 37214, 800-428-4442.

E. Substitution Procedures: See Instructions to Bidders.
   1. Submit evidence that the proposed substitution complies with the specified requirements. Comply with Section 01 60 00.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System:
   1. Membrane: Thermoplastic olefin (TPO).
   2. Thickness: .060 mil
   3. Membrane Attachment: Fully Adhered.
   4. Slope: 1/4 inch per foot
   5. Comply with applicable local building code requirements.
   6. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
   7. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating.

B. Insulation:
   1. Total R Value: 20 minimum.
   2. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on top.
   3. Base Layers: Polyisocyanurate foam board, non-composite.
      a. Attachment: Mechanically fastened.
   4. Top Layer: Where shown and required: 1/4”/foot tapered Polyisocyanurate foam board, non-composite.
      a. Attachment: Adhesive attachment.

2.3 TPO MEMBRANE MATERIALS

A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
   1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch (0.61 mm) plus/minus 10 percent.

2. Sheet Width: Provide sheets of width necessary to accommodate batten spacing required by manufacturer for project conditions.
3. Puncture Resistance: 380 lbf (1174 N), minimum, when tested in accordance FTM 101C Method 2031.
4. Solar Reflectance: 0.81, minimum, when tested in accordance with ASTM C 1549.
5. Color: White.
6. Acceptable Product: Energy Guard TPO by GAF.

B. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent.
2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D 638 after heat aging.
3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D 1004 after heat aging.
5. Color: White.
6. Acceptable Product: EverGuard Detailing Membrane by GAF.

C. Tape Flashing 6 inch (140 mm) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.045 inch (1.6 mm) nominal; EverGuard Cover Tape by GAF.

D. Pourable Sealer: One Part Pourable Sealer by GAF.

E. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings; TPO Solvent Based Bonding Adhesive 1121 by GAF.

F. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.

G. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Termination Bar by GAF.

H. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; Everguard TPO Cut Edge Sealant by GAF.

I. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; Flex Seal Caulk Grade by GAF.

J. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; Vent Boot Pipe Flashing by GAF.

K. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch (3 mm) by 30 inches (760 mm) by 50 feet (15.24 m) long with patterned traffic bearing surface; TPO Walkway Rolls by GAF.

2.4 ROOF INSULATION AND COVER BOARDS

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: 4.0" = 2.0" + 2.0" + 1/4" per foot tapered iso where shown on drawings.
      a. Insulation Joints must be staggered.
   2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   3. R-Value (LTTR):
      a. 4.0" = 23.6 LTTR
   4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
   5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
   7. Acceptable Product: EnergyGuard Polyisocyanurate Insulation by GAF.

B. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

2.5 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer. 24 gauge steel with kynar finish. Designer to select color.

B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; 24 gauge steel with Kynar finish. Designer to select color.

2.6 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

2.7 MISCELLANEOUS ACCESSORIES

A. Mechanical Fasteners for Insulation: Appropriate to purpose intended and approved by Factory Mutual; length required for thickness of material; with metal washers. Type as required to fastening into metal deck.

B. Roof Expansion Joint Cover:
   1. Expansion joint cover shall be a non-reinforced, foam- supported elastomeric bellows, insulated, with a bifurcated waterproof attachment to metal flanges. It shall be Expand-O-Flash Style (EJ/WC) with bellows and flange metal of aluminum as manufactured by Manville, PO Box 5108, Denver, CO. or approved alternate.

   2. Install where indicated on plans in accordance with the manufacturer's recommendations and good roofing practices. All intersections shall be prefabricated by the manufacturer. All splices shall be made with materials supplied for this purpose by the manufacturer. Install where new additions abut existing structures.

PART 3 EXECUTION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck. Observe and verify deck is not damaged prior to insulation installation.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

E. The total extent of preparation shall include the above and comply with the membrane manufacturer’s recommendations.

3.4 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

3.5 THERMOPLASTIC OLEFIN MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.6 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.

1. Use the longest practical flashing pieces.
2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
4. Provide termination directly to the vertical substrate as shown on roof drawings.

D. Roof Drains:
1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

G. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer. Curb to wall expansion joint to be installed at both additions to existing structures.

H. After constructing pitch pans for conduit and piping penetrating roof system, fill pitch pans with pourable sealer to completely waterproof penetrations.

3.7 FINISHING AND WALKWAY INSTALLATION

A. Install walkways around rooftop equipment on new roof that may require maintenance, and where indicated on the drawings.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.8 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

C. **NEW ROOFING SYSTEM SHALL NOT ALLOW PONDING WATER.** Architectural details are graphic in nature and do not show actual scale installation of roofing layers or flashing. Cut and/or taper wood blocking at roof edges along gutter side or at scuppers so that no ponding exists. Taper roofing insulation at perimeter of roof drains to allow proper drainage of surrounding roof, free of ponding.

3.9 CLEANING

A. Clean all contaminants generated by roofing work from building, roof membrane, flashing, and surrounding areas, including bitumen, adhesives, sealants, clay, dirt and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

3.11 EXISTING ROOFING SYSTEM

A. Patch all areas of existing roof surfaces disturbed during re-flashing, mechanical work, or other areas needing repair. Match surface conditions (ie: gravel or smooth surface, asphalt shingle, etc.). Owner's representative to inspect and approve all work and entire roof surface prior to acceptance. Level areas where ponding water previously occurred.

END OF SECTION

COMPANY LETTERHEAD

CERTIFICATE OF GUARANTEE FROM INSTALLER

We, _____
(Name of Company or Contractor) agree to maintain the roofing and flashing on the below mentioned building for the period indicated. This agreement is to render the roof and the flashing waterproof subject to the conditions outlined below.

OWNER OF BUILDING _____

Location of Building _____

City _____ Roof Area _____square feet_____

This Guarantee effective this _____day of _____ , 20_____, for the term of two (2) years from this date, provided any defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that the Contractor will not be responsible for leaks or failure in the roofing system or flashing due to sustained winds in excess of speeds stated in manufacturer's warranty, distortion of the foundation on which the roofing rests, excessive hail storms, or any other conditions over which we have no control as stated in manufacturer's exclusions.

Signed

_____
Name of Company

By _____

Position _____

Company is a _____
Corp./Partnership/Individual

NOTARY PUBLIC

Registered in the State of _____

SEAL

NOTE: Roof system manufacturer's NDL Twenty (20) year warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - **NO EXCEPTIONS**.

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SCOPE

A. The work required under this specification includes all labor, materials, equipment and services necessary for and reasonably incidental to the completion of all metal flashing and counterflashings, wall flashings, parapet cap flashing, joint covers, and other metal work required to complete the job.

1.2 RELATED SECTIONS

A. Section 07 54 13: Thermoplastic Membrane Roofing

B. Section 07 62 10: Gutters and Downspouts

C. Section 07 92 00: Sealants

1.3 WORKMANSHIP

A. All workmanship shall be in accordance with plans, with the various sections uniform, and sections accurately fitted and rigidly secured. All exposed edges shall be seamed, and all work shall be neatly fitted to the framework, with necessary ribs or stiffeners and other reinforcements required to make all sections rigid and substantial. This section to comply with SMACNA Standards.

B. Proper allowance shall be made in all cases for expansion and contraction, with the vertical joints not secured directly but constructed weather and watertight to allow members to slide freely. Joint covers shall be installed over all joints.

PART 2 PRODUCTS

2.1 MATERIALS

A. All sheet metal shall be pre- finished steel unless noted otherwise, not less than 24 gauge, and shall be compatible to other materials they may be in contact with. No dissimilar metals will be used together.

B. Fasteners shall be non-rusting materials which are not subject to galvanic action. Fasteners shall be of proper length and spacing to assure secure attachment, fit and alignment. Furnish and install continuous clip at cap flashing. Provide pre-finished fasteners, matching pre-finished flashing color.

C. In general all exposed flashing is pre-finished material, but where exposed galvanized iron flashings occurs, paint grip materials shall be used.

D. Where flashing shown must be fabricated into watertight multi-sided slopes, use paint grip material with soldered joints.
   1. Solder: Half and half solder made from virgin lead and tin shall conform to the Standard Specifications of the ASTM, E-32, latest edition.
   2. Flux: All galvanized sheet metal shall have non- corrosive acid used as a flux.
   3. All exposed paint grip galvanized material shall be painted color as selected by Architect.

E. Pre-finished flashing to be shop formed sections out of material supplied by the metal roofing manufacturer with same color selection available.

F. Flashing and Trim: Cap Flashing and Counterflashing - 24 gauge prefinished steel. Pitchpocket - two (2") inches deep, 24 galvanized iron. All flashing and trim located in areas which are visually exposed shall be prefinished unless noted otherwise.

G. Provide cap and parapet flashing in minimum lengths of 10 feet or more between joints.

2.2 FINISH

A. Pre-finished Trim and Flashing: Finish: Factory applied Kynar 500. Color: To be selected by Architect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install work watertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion or contraction.

3.2 FLASHING

A. Flash walls, etc., as detailed. Flashing shall be of material and gauge as specified on plans. All walls flashing, crickets, counterflashings, etc., shall be installed in accordance with SMACNA standards and in conformance with details shown or implied on plans.

B. Counterflashing generally shall be in 10'-0" lengths. Counterflashing shall be free from longitudinal joints. End joints in counterflashing generally shall not be soldered. Flashing to be installed with masonry, no saw cut installations will be allowed.

C. On counterflashings, the ends of one (1) length shall fit into a pocket on the adjacent length which has been formed by soldering a skirter lining on the back of the adjoining member. Counterflashings must be bent to the required shape before being placed.

D. Provide splices for cap flashing as shown on drawings.

E. Provide flexible flashing with stainless steel band clamp for pipe roof penetrations.

F. Secure all cap flashings with continuous cleats on both sides of parapets. Lap cleat sections minimum 2 inches. Secure to wood nailers with screws at minimum 16 inches on center.

3.3 WORKMANSHIP

A. Fasteners shall be concealed anchors of compatible materials.

B. Metal surfaces shall be formed and applied in strict accordance with SMACNA sheet metal working standards.

C. No perforations of metal surfaces shall be made except as shown on details for flashing, closures, trim, etc.

D. All exposed edges shall be seamed and all work shall be neatly fitted to the framework, with necessary ribs or stiffeners and other reinforcement required to make all sections rigid and substantial.

E. Install work watertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.

END OF SECTION

SECTION 07 62 10

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pre-finished steel gutters and downspouts, with expansion joints.

B. Related Sections:
   1. Section 03 30 00 – Cast-in-Place Concrete: Splashblocks
   2. Section 07 92 000 - Sealants
   3. Section 13 34 19 – Pre-Engineered Metal Building System

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A2244 - Color Change Quality.
   2. ASTM D659-80 - Chalking.
   3. ASTM A525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   4. ASTM D2794 - Impact Resistance
   5. ASTM D968 - Abrasion
   6. ASTM D1737 or D522 - Formability
   7. ASTM G23 - Weather-Meter Test. No peeling, blistering, cracking, or loss of adhesion

B. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
   1. SMACNA - Architectural Sheet Metal Manual

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Submit shop drawings showing fabrication, shapes, and dimensions. Provide material and finish data.

1.4 QUALITY ASSURANCE

A. Conform to Drawings for nominal sizing of components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack preformed materials to prevent twisting, bending, or abrasion, and to aid ventilation. Slope to drain.

B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pre-finished Steel: 24 gage core steel, color as selected. When pre-finished metal fascia is used, the pre-finished material color selection is to be from same selection of metal roof manufacturer.

2.2 COMPONENTS

A. Gutters and Downspouts: SMACNA Rectangular style profile; detailed as shown on drawings.

B. Provide end caps, downspout outlets, gutter and downspout straps, screens/strainers and other accessory components in profiles to suit gutters and downspouts.

2.3 ACCESSORIES

A. Anchorage Devices: Straps to SMACNA requirements.

B. Gutter and Downspout Supports: Straps.

C. Protective Back Coating: FF TT-C-494, bituminous.

D. Screens and Downspouts Strainers: Same basic metal as gutter. Screen - fabricated of 1/4" hardware cloth. Strainers are fabricated of galvanized wire, inserted into outlet tubes and held in place by friction.

2.4 FABRICATION

A. Form gutters and downspouts of size and profile indicated on Drawings.

B. Field measure site conditions prior to fabricating work.

C. Fabricate with required connection pieces.

D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

E. Hem exposed edges of metal.

F. Place sealant at pre-finished metal joints. Remove all excess material, wipe and wash joints clean.

G. Fabricate gutter and downspout accessories; construct watertight.

2.5 FINISHING

A. Two-coat Kynar 500 finish system:
   1. One coat epoxy base primer.
   2. One coat 70% Kynar 500 coating; Fluoropon by DeSoto or Duranar by PPG.

B. Colors:
   1. Manufacturer's standard, color to be selected.

C. Warranty: Manufacturer's standard 20 year.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and conditions are as acceptable.

B. Beginning of installation means acceptance of existing conditions and substrate.

3.2 INSTALLATION

A. Install gutters, downspouts, and accessories. Install gutter hangers at 2'-0" o.c. and at each expansion and control joint. Install expansion joints at 50’-0” max. Unless noted otherwise.

B. Joint lengths with formed seams constructed watertight. Flash and seal gutters to downspouts and accessories. Construct expansion joints as detailed on Drawings.

C. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

D. Seal metal joints watertight. Install sealant in inside surface of gutters at each joint. After sealing, wash metal clean with solution and rinse with water.

E. Attach downspouts with straps on 48" centers.

F. Install screens and strainers on gutters and downspouts. One screen per downspout.

G. General Contractor to provide splash block at each downspout. No splash block is required where downspout empties onto pavement or concrete surface.

END OF SECTION

SECTION 07 72 53

ROOF SNOW GUARDS & FLUE / VENT PIPE GUARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof Snow Retention System and Fastening Devices for prefinished standing seam metal roofs and flue vent pipes

1.2 RELATED SECTIONS

A. Section 13 34 19 – Pre-Engineered Metal Building System

B. Section 07 62 00 - Sheet Metal Flashing and Trim

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings.
   2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Design Requirements for Systems:
   1. Provide at locations indicated on the Drawings.
   2. System Design: Snow retention system as designed by the manufacturer.
   3. Components of the system supplied by the same manufacturer.
   4. Accessories and Fasteners: Accessories and fasteners capable of resisting design forces in accordance with local building code.

1.5 SUBMITTALS

A. Comply and submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Prepared specifically for this project; showing dimensions of metal roof snow guards and accessories, fastening details and connections and interface with other products.

D. Verification Samples: For each product specified, two samples, minimum size for extrusions 6 inches (152 mm) long, representing actual product, color, and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in production of Metal Roof Snow Guard Products of the type specified with a minimum 5 years documented experience.

B. Installer Qualifications: Company specializing in installation of Metal Roof Snow Guard Products of the type specified with a minimum 3 years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components to job site properly packaged to provide protection against transportation damage.

B. Store products in manufacturer's unopened packaging in a clean, dry location until ready for installation.

C. Stack all materials to prevent damage and to allow for adequate ventilation.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Dynamic Fastener Service Incorporated, which is located at: 9911 E. 53rd Street; Kansas City, MO 64133; ASD Toll Free Tel: (800) 821-5448; Tel: (816) 358-9898; Fax: (816) 358-9899; Email:jerodwebber@dynamicfastener.com,stevebutler@dynamicfastener.com; Web: www.dynamicfastener.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 ROOF SNOW GUARDS

A. Basis of Design: DYNA-GUARD; Snow Retention System for metal roofs as supplied by Dynamic Fastener Service Incorporated.

1. New construction.
2. Material: 6005A-T6 high tensile aluminum.
3. Extrusions: Comply with ASTM B85 and ASTM B221.
4. DYNA-GUARD:
    a. Lengths: 96 in (2438 mm). T-shaped profile.
    b. Hole Spacing: None.
    c. 1.)Field-Drilled Hole Requirements: 7/16 in (11 mm) on appropriate centers.
5. SNO-DAMS: Inhibits ability of snow and ice to slide under the DYNA-GUARD.
    a. Slides onto the DYNA-GUARD from either end. One SNO-DAM between every seam is required.
    b. Width: 3 in (76 mm).
    c. SNO-DAM Profile: As required for standing seam depth.
6. DYNA-CLAMPS: Non-ferrous, non-piercing clamp for attachment to standing seam roofs.
    a. Set Screws: Round-point stainless steel accommodating different profiles of standing seam metal roofs and won't pierce the panel.
    b. Bolts: English standard 5/16-18 bolt (No metric bolts available).
    c. DYNA-CLAMP Profile: DC Series. Type as required for prefinished metal roof panel standing seam profile
7. DYNA-CLIPS: Provide if required for anchoring Dyna-Guard to Dyna-Clamp.
8. DYNA-SPLICE: Provide where splicing Dyna-guard sections together.
9. Aesthetic Sheet Metal Strips: Supplied by others for installation into the DYNA-GUARD T-shaped profile.
    a. Prefinished strips of same metal material as the roof with same color.
    b. Width of Strips: 2 in (51 mm).
    c. One strip per length of DYNA-GUARD Strips insert into DYNA-GUARD extrusion to help conceal the snow retention system.

2.3 ROOF FLUE AND VENT PIPE GUARDS

A. Provide same product as selected snow guard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation and the approved shop drawings.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with snow retention system manufacturer's instructions and approved shop drawings. Coordinate the installation with the manufacturer of the roof substrate to which it is installed.

B. Attach using manufacturer's fasteners, spaced in accordance with approved shop drawings.

C. Install extrusions in such a manner that horizontal lines are true and level and vertical lines are plumb.

D. Do not allow components to come into contact with dissimilar materials.

E. Inspect each clamp and component to insure assembly is intact and secured to the roofing per manufacturer's instructions.

F. Set guard at 3'-0" up roof from eave.

3.4 INSTALLATION –FLUE AND VENT PIPE GUARDS

A. Install flue/vent pipe guards at all flue and vent pipes where they penetrate metal roof. Span at least two seams of roof panels uphill from penetration.

B. Set guard at 1'-0"-2’-0” above flue or vent pipe.

3.5 PROTECTION AND CLEANING

A. Protect installed products until completion of project.

B. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 81 16
SPRAY APPLIED FIRE RESISTIVE MATERIAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-proofing of interior structural steel.
   2. Installation accessories.

1.2 RELATED SECTIONS

A. Section 05 12 23 - Structural Steel
B. Section 05 21 00 - Open Web Steel Joists
C. Section 05 31 23 - Metal Decking
D. Section 07 84 13 - Firestopping.

1.3 DEFINITIONS

A. Interior Applications: Conditioned spaces, protected from weather.

1.4 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Evidence of Acceptable Testing: Submit for each fire-resistance rated assembly to be constructed. Listing of the assembly to be used in the current edition of the Underwriters Laboratories, Inc."Fire Resistance Directory" will be considered evidence of acceptable testing. In lieu of such a directory listing, official printed notification from Underwriters Laboratories Inc., stating that the assembly in question has been tested and approved, will also be considered evidence of acceptable testing.

C. Product Data: Submit complete product and system description, including installation instructions and limitations on use.

D. Test Reports: Submit results of field quality control tests

E. Certificate of Acceptability of Substrates: Submit fire-proofing manufacturer's certification that substrates to receive fire-proofing manufacturer recommends use of a bonding agent to ensure adequate bond for fire-proofing, follow manufacturer's instructions.

F. Materials Certificate: Submit fire-proofing manufacturer's certification that products to be supplied conform to requirements of the contract documents and are recommended by the manufacturer for application indicated.

G. Certificate of Compliance with Asbestos Requirements: Submit fire-proofing manufacturer's certification of compliance with all asbestos requirements specified under "Quality Assurance".

1.5 QUALITY ASSURANCE

A. Coordination of Shop Applied Coatings: Coordinate to avoid conflict and adhesion problems. Testshop painted steel to confirm adhesion and compliance with UL Designs.

B. Restrictions for Painted Substrates: Spray applied fireproofing shall not be applied to painted substrates except as permitted by ANSI/UL 263, Article II - General, paragraph 8 - Coating Materials.

C. Manufacturer's Restriction: Do not apply fireproofing over painted substrates if the fireproofing manufacturer prohibits or does not recommend application over painted substrates.

D. Field Testing: Comply with Section 01 40 00 - Quality Requirements. Provide field testing for installed fireproofing thickness, dry density, and cohesion/adhesion bond strength.
   1. Test Standard 1: ASTM E605 Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
   2. Test Standard 2: ASTM E736 Standard Test Method for Cohesion/Adhesion
   3. Test Quantities: One Test Standard 1 and one Test Standard 2 for each 50 bags of fireproofing product used.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in dry, protected area in manufacturer's original shipping containers bearing labels which include UL fire resistance ratings, manufacturer's name, product name, date of manufacture, and shelf life instructions where required.

B. Do not use products beyond manufacturer's indicated shelf life.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Minimum ambient and substrate temperatures for 24 hours immediately preceding, during, and for 24 hours after fire-proofing installation: Provide adequate air circulation to ensure proper curing of fire-proofing materials.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with other work as required to ensure that installed materials are not damaged during construction period and that fire resistance ratings are not compromised by work of other trades.

B. Schedule fire-proofing installation sufficiently in advance of other work to permit field quality control testing and any required corrective procedures to be completed before construction which might interfere with these operations is started.

C. Do not begin to install fire-proofing on underside of metal roof decking until roofing installation is finished; do not allow traffic on roof during fire-proofing installation and drying period.

PART 2 PRODUCTS

2.1 APPLIED FIREPROOFING- 15 POUND DENSITY GYPSUM CEMENT FIREPROOFING:

A. Applications: For interior, dry, non-freezing locations with controlled humidity less than 50%.
B. ASTM E605, Dry Density: Comply with UL designs used.
C. ASTM E736, Cohesion/Adhesion Bond Strength: Minimum 200 pounds per square foot.
D. ASTM E761, Compressive Strength: 1,200 pounds per square foot, 10 percent deformation.
E. ASTM E859, Air Erosion Resistance: Maximum 0.000 grams per square foot weight loss.
F. ASTM G21, Mold Resistance: No growth after 28 days.
G. Reference Products:
   1. “Pyrolite 15 High Yield”, Carboline, division RPM International Inc.
   2. “Monokote MK6”, W.R. Grace
   3. “Cafco 300”, Isolatek International
   4. “Type 5GP”, Southwest Fireproofing, division RPM International Inc.

2.2 ACCESSORY MATERIALS: Provide all materials shown in each UL design used. Provide primer,bonding agent, adhesive, reinforcing mesh recommended or approved by fireproofing manufacturer for each type of fireproofing.

2.3 ADDITIONAL PERFORMANCE REQUIREMENTS:

A. Fire Resistance Ratings: Meet Building Code for the Construction Classification of the building as noted on Drawing Sheet A1.1

B. Extent: For steel required to be fireproofed, also apply fireproofing to bracing, clip angles, support angles, and other steel members. Install at locations noted on Drawing Sheet A1.1

C. UL Designs: as required for each condition.

D. Mineral Fiber Content: None permitted.

E. Asbestos Content: None permitted including actinolite, amosite, anthophyllite, chysotile,crocidolite, and tremolite.

PART 3 EXECUTION

3.1 APPLIED FIREPROOFING INSTALLATION: Comply with manufacturer's instructions andrecommendations.

A. Sequence and Coordination: Sequence work and coordinate fireproofing with all related work to:
   1. Protect structure from fire at the earliest practical time.
   2. Minimize exposure of installed fireproofing to weather and damage.
   3. Minimize disturbance of installed fireproofing by work of other trades.
   4. Complete fireproofing installation prior to installation of obstructions such as ductwork.
   5. For roof decks, complete roof installation and prohibit roof traffic prior to fireproofing installation.

B. Preparation: Clean and prepare substrates. Remove oil, grease, loose mill scale, dirt, coatings which inhibit bond, incompatible coatings, coatings not listed in UL tested assemblies, and all other substances which could impair bond.
   1. Mask, cover, and protect adjacent work from over spray or fall out.
   2. Provide temporary enclosures to control wind and environmental conditions.

C. Fireproofing Application: Exactly match UL designs and assemblies.
   1. Primer, Bonding Agent: Treat substrates if recommended by fireproofing manufacturer.
   2. Adhesive: Apply adhesive if recommended by fireproofing manufacturer.
   3. Reinforcing: Apply reinforcing if recommended by fireproofing manufacturer.
   4. Fireproofing Thickness: Comply with UL designs.
   5. Fireproofing Density: Comply with UL designs.
   6. Curing: Comply with fireproofing manufacturer’s recommendations.
   7. Cleaning: Clean up and remove over spray and fall out.
   8. Inspection: Inspect fireproofing for damage immediately before concealing.
   9. Repair: Repair fireproofing to eliminate all damage and to maintain fire resistance.

End of Section

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions).

B. Openings and penetrations in fire-rated partitions or walls containing fire doors.

C. Openings around structural members which penetrate walls.

1.4 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
   1. Section 07 92 00 - Joint Sealers
   2. Section 04 22 00 – Concrete Unit Masonry Units
   3. Section 07 91 06 – Fire Rated Expansion Joints
   4. Section 21 13 01 - Fire Suppression Sprinkler Systems
   5. Section 22 01 00 – Plumbing
   6. Section 23 01 00 - Basic Mechanical Materials and Methods
   7. Section 23 07 13 - Mechanical Insulation
   8. Section 26 00 10 - Basic Electrical Materials and Methods

1.5 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems”

D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
   1. UL Fire Resistance Directory:
      a. Firestop Devices (XHJI)
      b. Fire Resistance Ratings (BXRH)
      c. Through-Penetration Firestop Systems (XHEZ)
      d. Fill, Voids, or Cavity Material (XHHW)
      e. Forming Materials (XHKU)
      f. Joint Systems (XHBN)
      g. Perimeter Fire Containment Systems (XHDG)
   2. Alternate Systems: “Omega Point Laboratories Directory” (updated annually).

E. Test Requirements: ASTM E 1966, “Standard Test Method for Fire Resistive Joint Systems”

F. Test Requirements: ASTM E 2307, “Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus”

G. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops”

H. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials”

I. ASTM G 21, “Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi”

J. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

K. All major building codes: IBC

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies or support live loads and traffic. The installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

F. Source Limitations: Obtain firestop products and systems from a single manufacturer.

1.7 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.

B. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in document.

C. Submit material safety data sheets and certificates of compliance provided with product delivered to jobsite.

1.8 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the contractor or to an Installer engaged by the contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in project to a single firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:
Hilti Accredited Firestop Specialty Contractor
UL Approved Contractor
FM 4991 Approved Contractor

D. Firm with not less than 3 years experience with firestop installation.

E. Successfully completed not less that 3 comparable scale projects using similar systems.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet. For non-water resistant firestop materials, protect from exposure to water -- firestop materials that are water resistant shall be protected until fully cured.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:
   1. Hilti, Inc., Tulsa, Oklahoma
      800-879-8000/www.us.hilti.com
   2. 3M, Inc.
   3. STI
   4. Provide products from the above acceptable manufacturers; *Refer to Section 01 60 00 for Product or Manufacturer Substitutions.*

B. <u>Source all firestop products from a single-source manufacturer.</u>

2.3 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079, ASTM E 1966, ASTM E 2307 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and/or combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors, the following products are acceptable:
   1. Hilti CP 680P or CP 680M Cast-In Place Firestop Devices:
      a. Add Aerator adapter when used in conjunction with an Aerator (Sovent system)
      b. Add metal deck adapter kit if utilizing CP 680P or M on corrugated metal deck.
      c. Add height extension if utilizing CP 680P or M in concrete slabs thicker then 8".
      d. Add Hilti Water Module (2" up to 6") to achieve UL W-Rating
      e. Add Hilti TOP SEAL (1/2" up to 2") to achieve UL W-Rating
   2. Hilti CP 681 Tub Box Kit for use with bathtub installations.
   3. Hilti Toilet Flange for use with floor outlet water closets.
   4. Hilti coupling sleeve for use with floor, shower, or general purposes drains
   5. Hilti CFS-DID Drop-in devise for use with cored holes.

C. Pre-installed firestop devices containing built-in self-sealing intumescent inserts for use with data and communication cabling which allow for cable adds or changes without the need to remove or replace any firestop materials, the following product is acceptable:
   1. Hilti CP 653 Speed Sleeve
   2. Hilti CFS-CC Cable Collar for us in renovation work with existing cables.

D. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CFS-SIL SL: Self Leveling Silicone
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CFS-SIL GG: Gun Grade Silicone

E. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti CFS-SIL GG: Gun Grade Silicone
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti FS-ONE Intumescent Firestop Sealant

F. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti CFS-SP WB Firestop Spray
   2. Hilti CFS-SIL GG: Gun Grade Silicone
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CFS-SIL SL: Self Leveling Silicone

G. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck as a backer for spray material, the following products are acceptable:
   1. Hilti CP 777 Speed Plugs
   2. Hilti CP 767 Speed Strips

H. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CFS-PL Firestop Plug

I. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 620 Fire Foam
   3. Hilti CFS-SIL GG: Gun Grade Silicone
   4. Hilti CP 606 Flexible Firestop Sealant

J. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick
   2. Hilti-PL Firestop Plug

K. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti CFS-P PA Firestop Putty Pad
   2. Hilti Firestop Box Insert
   3. Hilti CFS-BL Firestop Block

L. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
   1. Hilti CP 643 N Firestop Collar
   2. Hilti CP 644 Firestop Collar
   3. Hilti CP 648E Endless Wrap Strips
   4. Hilti CP 648S Single Wrap Strips

M. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti CP 637 Firestop Mortar
   2. Hilti CFS-BL Firestop Block
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 675T Firestop Board

N. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti CFS-BL Firestop Block
   2. Hilti CP 675T Firestop Board

O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
   1. Hilti CFS-SP WB Firestop Spray
   2. Hilti CFS-SIL GG: Gun Grade Silicone
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CFS-SIL SL: Self Leveling Silicone

P. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
   1. Hilti CFS-BL Firestop Block
   2. Hilti CFS-PL Firestop Plug

Q. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

R. Provide a firestop system with an Assembly Rating as determined by UL 2079 or ASTM E 1966 which is equal to the time rating of construction joint assembly.

PART 3 EXECUTION

3.1 PREPARATION

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 penetrations are properly sized and in suitable condition for application of materials.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Comply with the firestop manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
   5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate construction of openings, penetrations, and construction joints to ensure that the firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate firestopping with other trades so that obstructions are not placed in the way prior to installation of the firestop systems.

D. Do not cover up through-penetration and joint firestop system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.3 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL or Intertek approved systems.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
   1. Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.
   2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
   3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Manufacturer’s Field Services: During initial installation, firestop manufacturer should be present to assure proper installation/application.

3.5 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation in the form of the Hilti CFS-DM Documentation Manager
The FTP is to include:
1. Architectural details
2. Firestop affidavit
3. Firestop system snapshot
4. Installation log
5. Firestop systems
6. IFC guidelines for Engineering Judgments
7. Product Information of utilized products
8. All other relevant documentation
9. Building code excerpts

B. Copies (electronic) of the FTP are to be provided to the general contractor, architect, inspector & owner at the completion of the project.

C. Identify through-penetration firestop systems with self-adhesive, preprinted labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. Installer/Contractor's name, address, and phone number.
2. Date of installation.
3. Through-Penetration firestop system and manufacturer's name.

3.6 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 07 91 06

FIRE RATED EXPANSION JOINTS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes fire rated preformed expanding foam joints for expansion joints in exterior walls and fire rated precompressed expansion joint with cover at connecting doors in rated walls where.

B. Work included shall be complete to furnish and install each item required in accordance with the manufacturer's recommendation.

1.2 RELATED SECTIONS

A. Section 03 30 00: Cast-in-Place Concrete

B. Section 04 22 00: Concrete Unit Masonry

C. Section 07 84 00: Firestopping

D. Section 07 92 00: Joint Sealants

1.3 SUBMITTALS

A. Comply with Section 01 33 00.

B. Shop Drawings:
   1. Indicate joint locations, dimensions, and adjacent construction.
   2. Provide details for transitions in plane and direction for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.

C. Product Data: Material description and application instructions.

D. Manufacturer’s certification that:
   1. Products are capable of withstanding temperature of 150 degrees F (65 degrees C) for required rating while compressed to minimum of movement capability dimension without evidence of bleeding of impregnation medium from material.
   2. Same material after heat stability test and after cooling to room temperature will self - expand to maximum of movement capability dimension within 24 hours at 68 degrees F

1.4 PRE-INSTALLATION MEETING

A. Pre-Installation Conference:
   1. Convene at Project site weeks prior to beginning work of this Section. Provide Architect with notice minimum 48 hours in advance of meeting

2. Attendance: Architect, Contractor, joint seal installer, and related trades
3. Review and discuss:
    a. Joint seal manufacturer's requirements, project conditions, substrate requirements allowable structural movement at joints, and protection of completed work.
    b. Transitions in plane and direction, and requirement for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years' experience in production of specified materials.

B. Installer Qualifications: Minimum 5 years' experience in work of this Section

1.6 DELIVERY, STORAGE AND HANDLING

A. In accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Contract Documents are based on products by Sika Emseal, 800-526-8365, www.emseal.com.
B. Substitutions:
    1. Inpro Architectural Products, Muskego WI
    2. Approved Alternates

2.2 MATERIALS

A. Exterior Wall Joint Seal:
    1. 1. Basis of Design: Emshield WFR2 by Sika Emseal.
    2. Description: Silicone coated, ultraviolet resistant, dual-faced, fire-rated, watertight primary wall seal.
    3. Form: Precompressed to less than design joint size, packaged in shrink-wrap packaging.
    4. Fire protection rating: 2 hours, tested to UL 2079.
    5. Movement capability: Plus and minus 50% (total 100%) of nominal material size
    6. R-value: 1.03 per inch depth at nominal joint size compression, tested to ASTM C518.
    7. STC rating: 62 in STC 68 wall, tested to ASTM E90.
    8. OITC rating: 52 in OITC 52 wall, tested to ASTM E90.
    9. Air permeability: Maximum 0.02 liter per second per square meter, tested to ASTM E283 at 75 Pa.

10. Water penetration: No water penetration, tested to ASTM E331 at 5000 Pa test pressure.
11. Wind loading: No deflection, tested to ASTM E330 at 4954 Pa or 200 MPH wind.
12. VOC Emissions: CDPH-1.2-2017: Pass
13. Color: To be selected from Sika Emseal full color range.
14. Adhesive: Epoxy type, furnished by joint seal manufacturer.
15. Silicone: Field applied corner bead at face of seal to substrate interface, furnished by joint seal manufacturer, in same material and color as used in factory coating.
    a. Abrasion Resistance: Less than 1% weight loss, tested to ASTM D4060
    b. Fuel Resistance: Pass, tested to ASTM C719/C1135
16. Intumescent Sealant: Field applied to face of joints, furnished by joint seal manufacturer

B. Floor Joint Seal:
1. Basis of Design: SJS-FR2 by Sika Emseal.
2. Description: Traffic grade upper silicone sealing surface, factory coated on underside with intumescent fireproofing material, adhered to fire-retardant impregnated foam backing, bonded to both sides of extruded composite spline, adhered with field-applied epoxy adhesive, with surface-mounted traffic plate attached to spline.
3. Form: Precompressed to less than nominal material size for installation into designed joint size equal to material nominal size.
4. Cover plate: Shot blasted aluminum, thickness to suit foot traffic loading conditions.
5. Fire protection rating: 2 hours, tested to UL 2079.
6. Movement capability: Plus or minus 50 percent, total 100 percent.
7. Color: To be selected from Sika Emseal full color range.
8. Adhesive: Epoxy type, furnished by joint seal manufacturer.
9. Silicone: Field applied sealant band at face of seal to substrate interface, furnished by joint seal manufacturer; same material and color as factory coating.
    a. Abrasion resistance: Maximum 1 percent weight loss, tested to ASTM D4060.
    b. Fuel resistance: Pass ASTM C719 and ASTM C1135.
10. Intumescent Sealant: Field applied to face of joints, furnished by joint seal manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean joints thoroughly; remove loose and foreign matter that could impair adhesion or performance.

3.2 INSTALLATION

A. Install joint seal in accordance with Sika Emseal instructions and approved Shop Drawings.

B. Remove joint seal from precompressed packaging, immediately insert into joint, and allow to expand.

C. Use temporary retainers if required to maintain joint seals in position until expansion is complete.

D. Install joint sealer in accordance with Sika instructions.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparing sealant substrate surfaces
   2. Concrete slab control joint filler
   3. Sealant and backings
   4. Sill Sealer

1.2 RELATED SECTIONS

A. Section 03 30 00: Cast-In-Place Concrete

B. Section 04 21 13: Brick Masonry

C. Section 04 22 00: Concrete Unit Masonry

D. Section 07 62 10: Gutters & Downspouts

E. Section 07 84 00: Firestopping

F. Section 07 91 06: Fire Rated Expansion Joints

G. Section 08 11 13: Hollow Metal Doors & Frames

H. Section 08 81 00: Glass & Glazing

I. Section 09 29 00: Drywall

J. Section 13 34 19: Pre-engineered Metal Building System

K. Section 32 16 00: Walks and Curbs

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
   2. ASTM C1087 - Sealant Compatibility with Glazing Materials and Accessories.
   3. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open Cell Foam).
   4. ASTM C920 - Elastomeric Joint Sealants.

B. Sealing and Waterproofer Institute (SWI):
   1. SWI - Sealant and Caulking Guide Specifications.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate work of this Section with all Sections referencing this Section.

1.7 WARRANTY

A. The Contractor must guarantee weathertightness for a period of two (2) years from the date of Substantial Completion of the building.

B. The Contractor will, at any time within the two (2) year period, remedy all leaks of any nature in any part of the building due to the use of faulty materials and/or workmanship under this section, without additional cost to the Owner. The Contractor shall further reimburse the Owner for any damage occasioned by such leaks.

C. The Contractor is cautioned to supplement the work, described in this section of the specifications, by any means necessary to permit the above guarantee, which he will be called upon to make as an obligation of the Contract.

D. Provide **Silicone sealant #2** manufacturer's twenty (20) year warranty. All other sealants to have manufacturer's minimum ten (10) year warranty provided.

E. Butyl Rubber Sill Sealer: Provide subcontractor and manufacturers One (1) year warranty from date of substantial completion.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. Polymer or Polyurethane Sealants:
   1. **Polyurethane Sealant #1**: ASTM C920, Type M, Grade NS, Class 25.
   2. ASTM C719, ASTM D412, ASTM C661, ASTM C679 and ASTM C510
   3. Polyurethane Sealant approved manufacturers:
      a. MasterSeal NP-150 by BASF.
      b. Note: A two-part sealant with custom color availability is to be provided where sealants are installed in exterior walls and interior walls with painted finishes so that color matches each finish color. Architect to approve color all sealant color matches.
   2. **Polymer or Polyurethane Sealant #2**: ASTM C920, Type S, Grade P, Class 25.
      a. Titebond "Weathermaster", self leveling, manufactured by Franklin International.
      b. MasterSeal SL1 or SL2 by BASF.

c. Sikaflex 1c SL or 2c SL by Sika
d. Approved alternate
e. Provide standard color selections. **Architect to approve color.**

B. Silicone Sealant:
1. **Silicone Sealant #1**: ASTM C920, Type S, Grade NS,Class 25, mildew resistant.
a. Sanitary 1702 by General Electric Silicone Products Division.
b. 786 by Dow Corning Corporation.
2. **Silicone Sealant #2**: Dow Corning No. **756** Silicone building sealant, Dow Corning Corporation, P.O. Box 994, Midland, MI 48686-0994; (800) 248-2481; www.dowcorning.com/construction.
a. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant, ASTM C 920, Type S, Grade NS, Class 50, for Use NT; SWRI validation.
b. Type: One-component, ultra-low modulus, neutral-cure silicone rubber sealant; *Dow Corning*® 756 Silicone Building Sealant, as manufactured by Dow Corning Corporation.
4. **Note: Silicone sealant #2 to have custom color availability, matching adjacent material where installed. Architect to approve color match.**
5. Acceptable Alternate Silicone Sealant Manufacturers: GE Sealants

C. Concrete Slab Control Joint Filler:
1. 2-part polyurea, Versaflex SL/85, rapid curing, manufactured by Versaflex, Inc., 87 Shawnee Avenue, Kansas City, KS 66105 (913) 321-9000.
2. 2-part polyurea, PE85, manufactured by Hi-Tech Systems, 1190 N. Del Rio Place, Onterio, CA 91764 (909)945-5530
3. Approved alternate

D. Sill Sealer:
1. Butyl rubber, continuous under thresholds.

E. Provide fire rated sealant, where installed in fire rated walls. Refer to section 07 84 00.

2.2 ACCESSORIES

A. Primer: Non-staining, clear type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Filler: Polyethylene foam rod, oversized 30% to 50%

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Backer Seal: “Greyflex” backer seal, manufactured by Emseal Joint Systems, LTD (800) 526-8365. No substitutions will be accepted.

2.3 SEALANT COLORS

A. Colors to be selected from manufacturer's standard color selection for each type of sealant specified with exception of two-part polyurethane sealants and silicone sealants, which are to match finishes as stated in 2.1 A & B. Architect to approve color matches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrates

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Protect elements surrounding work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing rods to achieve neck dimension no greater than 1/3 the joint width. For joints ½" to 7/8", install backer seal prior to installing backer rod material install backer seal and backer rods as required to keep a uniform depth along entire joint.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges. In no case, allow the depth of sealant be less than ½".

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints concave.

H. Interior sealants are not to be installed until building is tempered by HVAC system and temperature will remain constant. **DO NOT PAINT POLYURETHANE AND SILICONE SEALANTS**. Do not install sealants in walls or floors where paint, stain, etc is scheduled to be applied until after finishes are applied unless sealants are masked off during coating process.

I. Concrete slab control joint filler:
   1. Use only at concrete floors which **do not** receive any floor coverings or polished concrete finish.
   2. Prior to final seal coat, install joint filler flush with top of slab. Remove any excess filler.

3.4 SCHEDULE

A. General Exterior Construction (Non-stone or masonry construction):
   1. Polyurethane Sealant #1

B. Horizontal Exterior Locations:
   1. Polyurethane Sealant #2

C. Masonry Exterior Locations:
   1. Silicone Sealant #2

D. General Interior Construction:
   1. Polyurethane Sealant #1 (All wall control joints.)

E. Plumbing Fixtures:
   1. Silicone Sealant #1.

F. Horizontal Interior Locations:
   1. Polyurethane Sealant #2.

G. Concrete Slab Control Joint Filler
   1. All control joints for slab-on-grade and elevated slabs where no finish or floor coverings are scheduled.

H. Butyl Rubber
   1. Continuous bead below metal thresholds.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials to complete Hollow Metal Doors, Hollow metal frames, and related items as shown and specified.

1.2 RELATED SECTIONS

A. Section 04 22 00 - Concrete Unit Masonry

B. Section 08 14 16 - Wood Doors.

C. Section 08 71 00 – Finish Hardware

D. Section 08 81 00 – Glass and Glazing

E. Section 09 29 00 – Drywall

F. Section 13 34 19 – Pre-Engineered Metal Building System

G. Division 26 - Electrical Requirements.

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Shop Drawings: Submit prior to fabrication for approval of Architect detailed shop drawings, showing all doors, frames, other miscellaneous materials. Shop drawings to show all locations of reinforcement for door hardware in doors and frames.

1.4 REFERENCES

A. Comply with ADA Accessible Guidelines in regard to accessible or handicapped features.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hollow Metal Frames -
1. Manufactured by Steelcraft, Ceco, Curries or Amweld, or approved alternate, constructed of cold rolled steel, commercial quality, annealed and temper passed. All frames, interior, exterior: 16 gauge all openings 3'-6" or less, and 14 gauge for all openings over 3'-6".

2. Exterior Frames: **Fleming** or approved alternate, special galvanized, paintable. Field paint all doors and frames.
3. Frames:
    a. All frames shall be a one piece unit type with head and jambs completely mitered and face joints continuously welded in their entirety and ground smooth. Inside corners to be caulked prior to painting. The use of tenons or bent tabs is not acceptable. Where transoms and sidelights are required, frames: shop assembled for a proper fit, then shipped in largest size units permitted by shipping restriction. Mullions: assembled by sliding two sections together with continuous welded interior guides. Screwed on mullion covers and visible seams, not acceptable. All seams ground smooth. All exposed welding tabs ground smooth.
    b. No KD type frames shall be permitted.
4. Provide concealed reinforcements, drilled and tapped, to receive hardware. Hinge reinforcements: 10 gauge with top hinge high frequency usage hinge reinforcement, 10 gauge angle stiffener welded to both sides of the frame and hinge reinforcement. Lock reinforcement: spring type stabilizer to hold lock in place. Lock and surface applied hardware reinforcement 10 gauge. Clip angles: spot welded to bottom of each frame for anchoring to floor. Mortar 14 gauge anchors, one per each 2' of height, per jamb of a type to suit conditions and requirements. All other reinforcement for hardware to be minimum 10 gauge.
5. Frames where Underwriter Labeled doors are used: carry Underwriter Label frame.
6. Provide three (3) rubber silencers on strike side of all frames.
7. All exposed screws to be countersunk using flathead screws, flush with surface.

B. Hollow Metal Doors:
1. Non-label and label steel doors: to be completely flush design with lights, louvers, etc., as required on schedule doors as manufactured by Ceco, Amweld, Steelcraft, Curries, Mesker, Dittco, Truscon, or approved equal. Provide **type "A" series** doors with flush door light frames where lights are called for on drawings.
2. Exterior Doors: Fleming or approved alternate, 'D' Series, special galvanized, flush design, paintable. Field paint.
3. Construction: Doors shall be constructed of 18 gauge sheets for interior applications, and 16 gauge for exterior applications. Leveled steel formed and rigidly connected and reinforced inside with continuous vertical interlocking 24-gauge stiffeners. All doors shall be continuously arc welded vertically where the two outer sheets are joined on edges and dressed smooth.
4. All exterior doors shall be insulated and sound deadened with super-core expanded foam or approved alternate.
5. Provide and properly locate required reinforcement in door for all door mounted hardware.
6. For door leaf 3'-6" to 4'-0" or wider, provide preparation for 2 pairs butt hinges or continuous hinge as specified.

C. Doors and frames shall be prepared to receive hardware as specified in section 08 71 00 and glass of type, size, and shape as shown on drawings. Use reinforcing plates welded to inner face of frames for all hardware.

D. All exterior doors to receive aluminum thresholds. Supply with added aluminum spacer on exterior side if required. Threshold to be type and style to match details if shown on plans, but in no case on plans, no more than 1/2" in height with transition slope not to exceed 1:2 to meet Arkansas Architectural Barriers Law and Americans with Disabilities Act Guidelines.

E. Coordinate frame throat sizes with wall thicknesses where frames are installed in stud and drywall partitions or where frames are installed in cut openings at existing masonry walls.

F. Provide three (3) rubber door silencers for each single leaf door frame, and two (2) door silencers for each double leaf door frame.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate location and installation of reinforcement for all scheduled door hardware items attached to hollow metal doors and frames.

A. Coordinate installation with Section 13 34 19.

3.2 FRAME ANCHORING

A. Provide proper anchors for wall type frames are to be installed in.

B. Frames installed in existing masonry walls are to be bolted through at door jambs. Dimple set bolts and fill with metal filler and sand smooth.

C. Hollow metal door frame jambs and heads are to be slushed full of mortar. Refer to Section 04 22 00 Concrete Masonry Units.

3.3 FINISHES

A. All surfaces to be job finished shall be thoroughly cleaned, removing all rust, scales, grease, etc.

B. All exterior hollow metal doors and frames: Given shop coat of rust resistant prime paint oven baked.

3.4 STORAGE AND ERECTION

A. Carefully store frames in an upright position, not on ground, protected from moisture and weather. Frames and doors that are dented or sprung, before, during, or after installation will not be accepted.

END OF SECTION

SECTION 08 14 16

WOOD DOORS

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install wood doors as shown and as specified herein. Doors are to be of type, size, and design shown and scheduled on drawings.

1.2 RELATED WORK

A. Section 08 71 00 – Hardware

B. Section 08 81 00 - Glass & Glazing

C. Section 09 91 00 - Finishes

1.3 QUALITY REQUIREMENT

A. All wood doors shall meet N.W.W.D.A. Industry Standard 1-A and Architectural Woodwork Institute Section 1300-G-3, Type FPC-7.

1.4 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Submit shop drawings in accordance with General Requirements. Include full size molding section detail for light and louver installation. Show glazing material, louver type and thickness, and face veneer grade and species.

1.5 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

1.6 DELIVERY

A. Package in heavy Kraft paper or polyethylene bags. Deliver and store in areas of Temperature and humidity such as will not adversely affect doors.

B. Doors shall be packaged in individual cartons.

1.7 PROTECTION

A. Protect work from damage until final acceptance.

1.8 WARRANTY

A. Manufacturer to provide lifetime warranty for interior duration, and two (2) year warranty for exterior duration.

B. Door warp tolerance shall not exceed 1/4" in any section of the door.

C. Stile, rail and core "telegraphing" shall not exceed 1/100" in any 3" span.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Masonite

B. Oshkosh Architectural Door Company.

C. VT Industries

2.2 MATERIALS

A. Doors shall be 1 3/4" thick, 5 or 7 ply, solid core, stain grade, to match existing species and finish. Top and bottom rails to be 1 1/8" min. width, stiles 1 3/8" min. Width prior to field fitting. Core shall be wood particle core meeting ANSI A208.1, Grade 1-LD-1, or 1-LD-2 with a 28-32 lb density, and type II adhesive. Veneer shall be provided on side edges and shall match species of face veneer. Where a pair of doors are called for, face veneer shall be book-matched grain. Provide mineral composition core when fire rating is required.

B. Contractor's Option: As an option to job finishing doors as per Section 09 91 00, contractor may provide pre-finished doors from manufacturer. If contractor selects pre-finished option, stain color will be custom.

2.3 FABRICATION

A. Fabricate premium type doors in accordance with requirements of WDMA Quality Standards (SCLC-5 or 7) unless specifically indicated otherwise.

B. Fabricate fire rated doors in accordance with requirements of Underwriter’s Laboratories (UL).

C. Provide doors with edge strips, of wood species to match face veneers.

D. Make cutouts and provide stops for glass.

E. Pairs of doors shall be products of a manufacturer who can furnish such doors without astragals and meet the UL requirements.

F. Pre-fit doors at factory with 1/8 inch tolerance on each vertical face, 1/8 inch tolerance at top, and ½ inch at bottom, except where undercuts are scheduled.

G. Machine doors for hardware as required by Hardware Schedule listed in Section 08 71 00, which will be supplied together with all necessary templates for hardware requiring door preparation.

H. Steel frame shop drawings will be furnished showing location and size of hardware preparation.

I. Bevel strike edge of single acting doors 1/8 inch in 2 inches. Radius strike edge of double acting swing doors, 2-1/8 inches.

J. All fire rated doors shall be factory prepped to receive hardware and glazing.

K. Pre-finish doors at factory with clear WDMA System #6 finish.

PART 3 EXECUTION

3.1 INSTALLATION AND WORKMANSHIP:

A. Install doors plumb and true to operate without bind or drag with 1/8" clearance top and sides. Provide 3/4" undercut at bottom unless indicated otherwise.

B. Doors damaged before or after hanging will be replaced.

C. All edge and end surfaces will be sealed with two (2) coats of door manufacturer's standard sealer before final hanging. **This includes top and bottom ends**.

D. All necessary refitting or adjustment shall be the Contractor's responsibility during the guarantee period.

E. Provide moldings and glass stops of same species as face veneers.

F. Pre-machine bevel on vertical edges of single doors or meeting stiles of pairs of doors.

G. Coordinate door light location with door hardware to assure no conflicts occur.

H. For door leaf 3’-6” to 4’-0” or wider, provide preparation for 2 pairs butt hinges or continuous hinge as specified.

3.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver: Protect doors at all times. Deliver doors to site after plaster and cement are dry and building has reached average prevailing relative humidity of locality.

B. Storage: Stack flat on 2 x 4 lumber, laid 12” from ends and across center. Under bottom door and over top of stack provide plywood or corrugated cardboard to protect door surface. Store doors in area where there will be no great variation in heat, dryness and humidity.

C. Handling: Do not drag doors across one another.

3.3 INSPECTION

A. Verify that door frames are of type required for door and are installed as required for proper installation of doors. Do not install doors in frames which would hinder the operation of the doors.

SPECIAL NOTE:
THERE CAN BE NO GLASS OR GLASS KITS IN DOORS THAT WILL INTERFERE WITH THE MOUNTING OF ANY FINISH HARDWARE. ENOUGH STILE AND RAIL MUST EXIST SO THAT NO SHIMS ARE NEEDED.

END OF SECTION

SECTION 08 31 13

WALL ACCESS PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials and equipment necessary for the furnishing and installation of access panels as required in walls and in masonry walls for mechanical or electrical equipment access. Provide proper model for panels installed in materials other than gypsum board.

1.2 SUBMITTALS

A. Comply with Section 01 33 00.

PART 2 PRODUCTS

2.1 MANUFACTURER/MODEL

A. Nystrom Model NT (masonry), Model RW (Stud and gypsum board)

B. Substitutions: Subject to compliance with requirements, one of the following may be substituted for that specified.
   1. Karp
   2. J.L. Industries
   3. Approved alternate.

C. Provide fire rated models of type required where installed in fire rated ceilings and walls, or where called for on drawings.

D. Panel size as needed for application, unless called out on drawings. Panel size and locations are to be approved by Architect prior to installation.

2.2 CONSTRUCTION

A. Galvanized bonderized 16 ga. steel door and 16 ga. frame.

B. Continuous piano hinge.

C. Key operated cylinder lock by access panel manufacturer, unless otherwise noted.

D. Panel finish: Primed for field paint.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that rough openings are correctly installed to receive panels.

B. Make necessary preparation of surrounding materials to accept panel installation.

C. Coordinate locations and sizes of required access panels with Architect for approval.

3.2 INSTALLATION

A. Install panels in accordance with manufacturer's instructions and provide concealed framing as required to properly install access panel.

B. Adjust panel operation and locking mechanism to ensure all features of access panel operate smoothly.

3.3 FINISH

A. Paint panel per Section 09 91 00.

B. Recessed perimeter grooves of panels installed in gypsum board walls to be clean and free of drywall mud prior to painting. Gypsum board infill and perimeter of panel to be flush with gypsum board finish surrounding panel.

END OF SECTION

SECTION 08 34 63

DETENTION HOLLOW METAL

PART 1 GENERAL REQUIREMENTS

1.1 SCOPE

A. Supply and install all Detention Hollow Metal work as shown on the drawings and as specified herein.

1.2 WORK INCLUDED IN THIS SECTION

A. Detention hollow metal frame.

B. Furnishing and delivery to the job site or designated vicinity location all embeded anchors as required to firmly anchor all materials specified in this section.

C. Plant and field fittings, welding, filling, grinding, and caulking of materials installed under this section.

D. Although such is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Finish painting in the field, Section 09 91 00.

B. Receiving, unloading distribution, setting and building in of all embeds. Embeds to be supplied by Detention Contractor and installed by Masonry or Concrete Subcontractor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, store and erect security materials in a manner that will prevent rusting, distortion, or damage. Replace damaged material. Store clear of the ground and protect from water and the elements. Wrap and carton or crate to adequately protect during shipment and storage at jobsite.

1.5 QUALITY ASSURANCE

A. Manufacturer: Provide detention equipment products and items produced by manufacturers who have no less than five years experience in manufacturing equipment for maximum security and medium security installation.

B. Installation shall be performed by manufacturer or his authorized representative under the manufacturer’s direct supervision.

1.6 SUBMITTALS

Comply with the requirements of Section 01 33 00

A. Shop Drawings: Submit complete shop drawings for fabrication, erection, and installation. Include plans, elevations, and large scale details. Show anchorages and accessory items.

B. Product Data: Submit manufacturer's product data and installation instructions

C. Warranty: Warrant all security detention equipment for workmanship, operation and locking mechanisms for a period of one year after final acceptance. During this one-year period, the manufacturer of detention equipment will, without cost to the Owner, make any adjustments to said mechanism or replace any worn or broken parts due either to faulty materials, defective construction or faulty installation.

1.7 PRODUCT HANDLING

A. Deliver equipment in cartons or crates to extent feasible.

B. Store in a protected location under cover with locks and operating and electrical in a securely locked room.

C. Store larger items on wood blocking under cover and out of the weather.

PART 2 MATERIALS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Detention Hollow Metal Manufacturers:
   1. Graham
   2. Trussbilt Inc. - St. Paul, Minnesota
   3. Pioneer - New Jersey
   4. Havershaim - Atlanta, Georgia

B. All materials used in execution of work shall be new and conform to specifications of ASTM.

C. Fastening Devices:
   1. All exposed screws and nuts shall be Torx security type or center pin rejection, to meet National Standard (ASTM 307 - Grade A).
   2. Screws and nuts shall be flat head, having an extra head which will twist off when fully secured, leaving the main head flush without slots.
   4. Each type of fastener must be indicated on shop drawings.
   5. All exposed screw fasteners shall be installed with LOCTITE, or approved equal thread locking adhesive/sealant.

2.2 ANCHORAGE DEVICES

A. For Weld Studs: Use TRW Division “headed” studs; weld to steel plates.

B. For Wire Anchors: Use ASTM A615 grade 40 deformed rebar; weld to 10 ga. steel plates formed as required.

C. For Steel Plate Anchors: Use galvanized steel sheets formed as required, thickness, sizes as indicated.

D. For Steel Plates: Use ASTM A36 steel; form as required.

E. For Expansion Anchors: Use FS FF-S-325 group II, type 3, class 3 sleeve type expansion anchors with FS QQ-A-325C type 1, Class 3 plated finish. Provide each anchor complete with bolt, expansion sleeve, hex nut, washer; 1/2 inch diameter size required with length as required for 4 inch minimum embedment depth except where indicated to be longer.

F. For Anchor Bolts Concealed From View: Use FS FF-S-325 group II, type 4, class 1 wedge type expansion anchors with FS QQ-Z-325C type 1, class 3 plated finish. Provide each anchor compete with bolt, expansion sleeve, hex nut, washer; 5/8 inch diameter size required with length as required for 2-3/4 inch minimum embedment depth.

2.3 DETENTION HOLLOW METAL DOOR

A. Contractor will salvage and relocate existing detention door and hardware to be installed in new Detention

B. Provisions for Hardware: Contractor to field verify existing mechanical hardware conditions. Provide replacement hardware for items that are damaged or cannot be relocated.

2.4 DETENTION PRESSED METAL FRAMES

A. Provide pressed steel frame for relocated detention door
   1. Interior Frame: Commercial grade cold-rolled steel, ASTM A366 or commercial grade hot-rolled and pickled steel, ASTM A569. 12 gauge.
   2. All joints will be fully mitered and continuously welded inside the miter across the full depth and width of the frame.

B. Furnish frame as a single, complete unit where possible.

C. Provisions for Hardware:
   1. Mortise, reinforce, drill and tap at the factory for relocated hardware. Field verify existing

D. Provide all frames with temporary spreader angles attached to the bottom of both jambs.

E. Frame Anchors: Locate jamb anchors at 8” from top and 4” from bottom and at 16” on center maximum. Locate head and sill anchors at 6” from ends and at 16” on center maximum where the masonry opening is 40” or greater.
   1. Anchors at Masonry: 1/8”, tee shape, 12 gauge, adjustable galvanized steel drilled to allow passage of vertical rebar and grouting; or steel straps welded to embeded steel anchor plates or angles.
   2. Anchors at Concrete: 1/2” Nelson studs welded to frame. Reinforce frame and anchors with 12 gauge steel plate.
   3. Anchors at Steel: 10 gauge zee welded to steel and frame.
   4. Floor Anchors: 12 gauge steel welded to bottom of each jamb drilled for expansion anchors.
   5. Provide and install frame stiffener plates, made of 10 gauge bent steel, at 8” o.c. each way in all frames with over 6” continuous width or height (one piece).

2.5 FINISHING

A. After assembly, smooth tool marks and surface imperfections by grinding, filling and sanding. Welded joints exposed to view and not continuously welded shall be filled with a metallic filler and ground smooth so as to show no exposed seam. This applied to both factory assembled and field assembled frame and detention equipment components.

B. Clean surfaces thoroughly of rust, oil, and other impurities and phosphate coat to condition the surface in accordance with Federal Specification TT-C-490.

C. Coat all surfaces, both inside and outside the frame, to a minimum thickness of 1 mil with rust inhibitive red iron oxide-zinc chromate primer (equal to Federal Specification TT-P-664).

PART 3 EXECUTION

3.1 INSPECTION

A. Installer of detention equipment must examine the substrates, rough-ins, and inserts related to installation of detention equipment and report in writing to the contractor of conditions detrimental to the proper and timely installation of this work. Do not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PREPARATION

A. General Contractor will receive, unload, store and protect detention and security equipment. Installer will verify and inventory all items and advise as to its proper storage.

3.3 INSTALLATION

A. Hollow metal frame in masonry construction will be set in place, and anchored and grouted. Contractor shall provide visual verification of solid grouting by observing the frames being grouted. Grout will be installed until it is released out of verification holes in glazing pockets. Contractor shall clean grout off directly after to avoid damage to frames.

B. Install unit plumb, square, properly aligned and securely anchored. Provide anchors, trim and accessories required for a complete, secure and functional installation.

C. Touch up welds and damaged areas with specified shop primer.

3.4 PROTECTION AND CLEANING

A. Handle all fixtures, material, assemblies and equipment to avoid injury to persons and to avoid damage to work in place. Satisfactorily repair or remove and replace work that has been damaged.

B. Protect adjacent surfaces from damage and soiling.

END OF SECTION

SECTION 08 36 14
SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated Sectional Overhead Doors.

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.
D.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications: Steel frame and supports.
B. Section 07 92 00 - Joint Sealers: Perimeter sealant and backup materials.
C. Section 09 91 00 - Paints and Coatings: Field painting.
D. Section 13 34 19: Pre Engineered Metal Building
E. Division 26 - Raceway and Boxes: Empty conduit from control station to door operator.
F. Division 26 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
   1. Design pressure: Wind load of 20 psf with deflection of no greater than 0.03 inches per foot of opening width.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.9 WARRANTY

A. Warranty: Manufacturer's limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

B. Warranty: Manufacturer's limited door warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 INSULATED SECTIONAL OVERHEAD DOORS

A. Insulated Steel Sectional Overhead Doors: 591 Series Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
   1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
      a. Panel Thickness: 1-5/8 inches (41 mm).
      b. Exterior Surface: Ribbed, textured.
      c. Exterior Steel: .015 inch (.38 mm), hot-dipped galvanized.
      d. End Stiles: 16 gauge.
      e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor
      f. High cycle spring: 25,000 cycles.
      g. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
      h. Thermal Values: R-value of 14.86; U-value of 0.067.
      i. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
   2. Finish and Color:
      a. Baked-on Kynar polyvinylidene floruoride high performance coating:
         1) Interior color, white.
         2) Exterior color, white.

3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:
   a. Interior mounted slide lock with interlock switch for automatic operator.
6. Weatherstripping:
   a. EPDM bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   a. Size: 3 inch (76 mm).
   b. Type: Standard lift.
8. Manual Operation: Chain hoist.
9. Electric Motor Operation: Commercial Door Operator RSX ½ HP. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. Entrapment Protection: Required for momentary contact, includes radio control operation.
      1) Electric sensing edge monitored to meet UL 325/2010.
   b. Operator Controls:
      1) Key operated control stations with open, close, and stop buttons.
      2) Surface mounting.
      3) Interior location.
   c. Special Operation:
      1) Radio control operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08 71 00

FINISH DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Door hardware.
   2. Miscellaneous finish hardware.

B. Related Sections:
   1. Section 08 11 13 - Hollow Metal Doors and Frames.
   2. Section 08 14 16 - Wood Doors.
   3. Section 08 34 63 - Detention Hollow Metal

1.2 SUBMITTALS

A. Comply with Section 01 33 00.

B. Submit through Contractor to Architect. Prior to submitting, contact Architect to discuss door hardware/keying meeting. If Architect elects, submittal will be reviewed at time of meeting. Supplier will make corrections as a result of meeting and distribute record copies to Architect and Contractor.

C. Hardware Schedule: Submit final hardware schedule organized by "sets", to indicate specifically product to be furnished for each item required on each door.

D. Templates: Furnish templates to each fabricator of doors and frames, as required for preparation to receive hardware.

1.3 DOOR HARDWARE/KEYING MEETING

A. Prior to ordering of hardware items, Contractor shall arrange meeting between, hardware supplier, Owner, and Architect to review and verify door hardware submittals and keying suggestions. This review meeting shall be considered as the submittal review. Any changes shall be incorporated in the hardware submittals and then resubmitted to Contractor and Architect as **record copy**. Contractor to notify all parties one (1) week prior to meeting date.

1.4 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features for all door hardware items used on this project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Product Quality: Hardware items are to be ANSI Grade 1 Certification.

2.2 HINGES

A. Manufacturers:
   1. Stanley
   2. Hagar
   3. Approved alternate

B. Material:
   1. Provide full mortise-type hinges with stainless steel pins, except steel pins with steel hinges; non-removable for all locations. Provide stainless steel hinges on exterior applications.
   2. Ball-bearing Function: Swaged, inner leaf beveled, square corners.

C. CONTINUOUS HINGES
   1. Roton, model 780-224 HD series. (No substitutions accepted)
   2. Warranty: Manufacturer's lifetime warranty.

2.3 LOCKS, LATCHES, AND BOLTS

A. Manufacturers:
   1. Schlage LV Vandlgard Series – Mortise lockset with Rhodes style lever handle
   2. Approved Alternate Manufacturers:
      a. Corbin Russwin
      b. Best Locks
      c. Approved alternate. Refer to Section 01 60 00.
   3. Warranty: L Series Mortise (3-year),

B. Materials:
   1. Strikes: Wrought box strikes, with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.
   2. Locks: locksets equipped with 6-pin tumbler; with interchangeable cores and keyed alike. Provide 2-3/4" backset. Provide three keys for each lock.

2.4 DOOR CONTROL DEVICES

A. Panic Device:
   Manufacturer and Product:
   1. Von Duprin 99 Series
   2. Corbin Russwin 5000 Series
   3. Sargent 80 Series
   4. Approved alternate.

5. Warranty: Provide minimum three (3) year manufacturer's warranty.
6. Unless called for otherwise, or where a fire door occurs, all panic devices will be cylinder doggable

B. Wall Bumper:
1. Rockwood 400 Series, Concave Style
2. Glynn-Johnson 60 Series, Concave Style
4. Approved alternate.

C. Closers:
1. Interior Doors:
   a. LCN 1460 Series with extra duty arm where called for on hardware schedule
   b. Approved alternate
      a. Warranty: Provide minimum 30 year warranty for closer operation.
2. Exterior Doors:
   a. LCN 4040XP-Spring Cush Series.
   b. Dorma 8900 Series with spring stop
   c. Approved alternate.
   d. Warranty: Provide minimum 30 year warranty for closer operation.
3. Provide all brackets and spacers necessary for all door and frame conditions.

D. Security Access Controlled Doors
1. Electric strike with associated power supply in concealed location, manufactured by Locknetics or approved equal. Access control device is provided by owner.
   b. Provide strike type as required to coordinate with latch and frame.
   c. Owner will install low voltage control wiring as required from access control device junction box to power supply and to electric strike. Contractor to provide conduit and boxes as required to conceal all wiring in walls, ceilings, doorframes, etc. Refer to electrical drawings for locations.

E. Materials:
1. Provide grey rubber exposed resilient parts.
2. Any floor stop other than that specified will not be accepted.
3. All closer cylinders to be cast iron.

2.5 MISCELLANEOUS HARDWARE

A. Silencers: Provide in metal door frames, unless not permitted for fire rating, or unless bumper-type weather-stripping is provided; three for each single door frame, two for double-door frame.
1. 3M
2. Hager
3. Glynn Johnson
4. Approved alternate.

B. Threshold:
(Threshold height not to exceed ½" to meet ADAAG guidelines.)
1. Model 896N, 5" deep, manufactured by National Guard Products, or approved alternate, ADA compliant panic threshold
2. Extruded aluminum, mill finish, neoprene seal, for exterior doors only.
3. Provide saddle-type threshold where threshold is called for at interior locations.

C. Weatherstripping:
1. Model 135N series, aluminum with neoprene seal, manufactured by National Guard or approved alternate.
2. Provide with natural anodized finish.
3. Provide other models as required to coordinate with special door hardware items.

D. Mullion Seal:
1. Model 5100S, gray color, manufactured by National Guard Products or approved alternate.
2. Install at all removable mullions.

E. Door Coordinator Manufacturers & Products:
1. Hager, #297D Coordinator. See drawings for size.
2. Ives CO series
3. Approved alternate.

F. Floor Stop:
1. Rockwood Model 463. Drill 1" dia. X 2 3/4" deep hole. Replaceable rubber bumper with torx-type screw. Epoxy grout stem into place.
2. Approved alternate.

G. Sweep
1. 198 Series by National Guard Products or approved alternate.
   a. Neoprene sweep with natural anodized aluminum trim. Size as required to cover door undercut.

H. Door Shoe (with Rain Drip & Brush Sweep)
1. 95WH Series by National Guard Products or approved alternate.
   a. Provide with natural anodized finish.
   b. Provide Door Shoe assembly at each exterior door leaf.

I. Astragal Set
1. 125N Series by National Guard Products
   a. One set aluminum with neoprene astragal seals with natural anodized finish.
   b. Install on each pair of exterior doors, extending from head to threshold.

J. Keyed Removable Mullion (Model as required to coordinate with each installation)
   1. Von Duprin
   2. Corbin Russwin
   3. Approved alternate.

K. Wall Stop
   1. Trimco #1205
   2. Ives #WS443
   3. Glynn-Johnson #WB35
   4. Approved alternate.

L. Drip Cap
   1. 2 ½" wide x 1 ½" deep, anodized aluminum.
   2. Model 16A, manufactured by National Guard Products or approved alternate.

M. Drip Strip
   1. 3/4" wide x 1 ½" deep, aluminum.
   2. Model 17, manufactured by National Guard Products or approved alternate.

2.6 FINISH

A. All exposed interior hardware and door control devices to be furnished with US26D Finish. Exterior hardware finish to be US32D.

B. Painted hardware items to match color of door control devices.

2.7 FABRICATION

A. Finish and Base Material Designations: Number indicate BHMA Code or nearest traditional U. S. commercial finish. US26D & US32D or equivalent.

PART 3 EXECUTION

3.1 COORDINATION

A. Hardware supplier to verify and coordinate door and frame preparation, including required reinforcement in hollow metal doors and frames for hardware attachment.

3.2 INSTALLATION

A. Hardware Mounting Heights: Door and Hardware Institute Recommended Locations for Builders Hardware for Standard Steel Doors and Frames, except as otherwise indicated.

B. Install each hardware item to comply with manufacturer's instructions and recommendations.

C. Door closers, door coordinators, and frame-mounted overhead stops shall be installed to frames, using machine thread type screws. Holes shall be tapped in hollow metal frames to accept threaded screws. Screws shall be of a size as recommended by hardware manufacturer.

D. All other hardware items mounted to door shall be required to be mounted to door with appropriate through bolts for wood doors and machine thread type screws for hollow metal doors. Holes shall be tapped in hollow metal door reinforcement to accept threaded screws. Screws shall be of a size as recommended by hardware manufacturer.

E. Door closers, door coordinators, and frame-mounted overhead stops at all **exterior and interior doors** shall have through-bolt connections at door. Exposed head of bolt shall be of a flush, smooth type.

F. **'TEK' TYPE SCREWS ARE NOT TO BE USED.** Use fasteners provided by hardware supplier for each corresponding hardware device for door and frame type and as specified in this specification.

G. Install each hardware item per manufacturer's instructions. If any item fails to operate properly because of improper installation, it shall be the installer's responsibility to correct. If item continues to malfunction or if Contractor or Architect suspects any hardware item to be defective, hardware supplier shall examine item in question. If Supplier determines item is defective, he shall replace item at no extra cost to owner.

H. Thresholds to be cut around jamb stops for snug fit to door jambs.

3.3 ADJUSTING

A. Hardware Adjustment: Return to project one month after Owner's occupancy, and adjust hardware for proper operation and function.

3.4 KEYING

A. Locksets and cylinders are to be master keyed to present schedule. Prepare and submit a detailed list of complete keying recommendations to the Architect, which will be discussed during keying meeting. Coordinate desired keying schedule with owner prior to submitting of keying recommendation. Furnish three (3) keys for each individual lock in addition to three (3) master keys.

B. Each key for entire project to be stamped for identification.

3.5 TYPICAL DOOR HARDWARE FOR EXTERIOR AND INTERIOR DOORS

A. Each leaf of all exterior hollow metal doors, unless noted otherwise, is to receive the following hardware items:
   1. ADA Accessible closer.
   2. Continuous hinges
   3. Weatherstripping set
   4. ADA Threshold (Set in butyl rubber sealant)
   5. Astragal set (for pair of doors)
   6. Door shoe
   7. Mullion seal (for removable mullions)
   8. Drip cap

B. Each leaf of all interior doors, unless noted otherwise, is to receive the following hardware items:
   1. Hinges:
      a. Three butt hinges for doors up to 3'-4"
      b. Provide continuous hinge for leaves 4'-0" or wider, at all exterior locations and at interior locations noted on hardware schedule.

   2. Provide three silencers for single leafs, two silencers for double leafs.

C. Refer to drawings for hardware sets schedule.

END OF SECTION

SECTION 08 81 00

GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, tools, equipment, services, operations and incidentals necessary to install, complete in every respect, all glass, glazing, and related work as indicated on Drawings and specified.

1.2 RELATED WORK DESCRIBED ELSEWHERE

A. Glass and glazing, as required under various Sections of these Specifications including, but not limited to:
   1. Hollow Metal Work: Section 08 11 13.
   2. Wood Doors: Section 08 14 16.
   3. Fire Rated Glass: Section 08 88 13.

B. Installation materials specified in Sealants and Caulking: Section 07 92 00.

1.3 REFERENCES

A. ASTM C1048 “Standard Specification for Heat Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.”

B. ASTM C1279 “Standard Test Method for Non-Destructive Photoelastic Measurement of Edge and Surface Stresses in Annealed, Heat-Strengthened, and Fully Tempered Glass” Requirements.

1.4 SUBMITTALS

A. General: Comply with the provision of Section 01 33 00.

B. Product Data: Within 30 calendar days after award of the Contract, submit:
   1. Complete materials list showing all items proposed to be furnished and installed under this Section.
   2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.

C. Shop Drawings:
   1. Submit detailed shop and installation drawings of all work under this Section to Architect for approval prior to ordering materials.
   2. Indicate glass sizes, thickness, glazing details and where mirrors are to be installed in the building.

3. Shop Drawings shall include engineering data on the Aluminum Entry/Storefront and other glazing systems, including the size and spacing of setting blocks under the glass and wind load.

1.5 FIELD MEASUREMENTS

A. Accurately field measure all openings to receive glass and cut glass to correspond to each measured opening. The General Contractor and Glazing Contractor shall be responsible for overall coordination and accuracy of the Field Measurements.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.7 GUARANTEE

A. Contractor shall furnish a written guarantee covering all mirror silvering from defects in material and workmanship for a period of five years from date of final acceptance of the building.

B. All glazing work performed under this Section shall be guaranteed against defects in materials and workmanship for a period of one year from date of final acceptance of the building. This guarantee, however, shall not cover accidental breakage of glass subsequent to acceptance except where breakage is due directly to defective materials and/or inferior workmanship.

PART 2 PRODUCTS

2.1 GLASS

A. General: Glass is called for by "type" (i.e. laminated, etc.) on Details and Schedules in the Drawings. The "types" are defined herein.

B. All glass shall conform to the requirements of Federal Specification DD-G-451c, or as indicated with individual glass types.

C. Each light shall bear the manufacturer’s label designating the type and thickness of glass. “AFPC V2 2701.1”

D. Individual glazed areas in hazardous locations shall meet requirements CPSC 16, CFR Part 1201.

E. Size: Sizes of glass indicated on Drawings are approximate, actual sizes of glass shall be taken from actual frames. Labels shall remain on glass until after inspection by the Architect.
   1. Actual design sizing shall be the responsibility of the glass manufacturer. Sizes indicated herein and on the Drawings are approximate only. Where required, the manufacturer's recommended changes shall be made. Note all such changes or revisions on the Shop Drawings submitted for approval.

2.2 GLASS TYPES

A. Laminated (shatter resistant) Glass: Shall be 9/16" thick clear composed of 1/4" clear float glass, 0.06" clear PVB and 1/4" clear float glass, manufactured by Viracon, Guardian, or approved alternate.

2.3 GLAZING COMPOUNDS AND SEALANTS

A. General: Use glazing compounds and preformed glazing sealant approved for the particular application as described herein and shown on the Drawings.

B. Glazing Compound shall be GE SILGLAZE, clear or neutral color, unless approved otherwise by the Architect.

C. Setting Blocks and Gaskets shall be extruded hard neoprene, clear or neutral color unless noted otherwise.

D. Tape shall be polyisobutylene base elastic compound with gauze reinforcement, equal to Presstite 162 Elastic Compound Tape, clear or neutral color unless noted otherwise.

E. Sealants used for glazing shall be G.E. Silicone, Dow-Corning Silicone Structural Sealant, or as approved by the Architect. Silicone shall be clear or neutral color as approved by Architect.

2.4 GLAZING ACCESSORIES

A. Provide all glazing accessories required to supplement those accessories which accompany the items to be glazed, and as needed to provide a complete installation, including glazing points, clips, shims, angles, beads, settling blocks, and spacer strips. Use ferrous metal, which will be exposed in the finished work, which has a finish that will not corrode or stain while in service.

2.5 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Verify all field dimension openings prior to glass fabrication and cutting. Cut pieces to fit actual opening sizes.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
   1. All glass shall be accurately cut or sized to fit openings and locations and shall be set by skilled glazers. Extreme care shall be exercised in sizing the insulating glass to allow recommended clearances around glass.
   2. Cut and install glass with any visible lines or waves running in horizontal direction.
   3. Fix movable and operating items securely, or in a closed, locked position until glazing compound has thoroughly set.
   4. Use beads or stops furnished with the items to be glazed to secure the glass in place.
   5. Items to be glazed shall be shop-glazed or field-glazed with glass of the quality and thickness specified.

3.2 GLASS SETTING

A. Wood and Hollow Metal Doors: Field glaze all wood doors with glazing sealant and flush solid wood stops as indicated on Drawings. (Metal stops where required for fire rating)
   1. Use sufficient glazing sealant to ensure a complete seal between glass and stop.
   2. After stops have been installed and pulled up tight, trim bead of sealant resulting from setting operations away from face of glass. Retouch damaged compound after glazing.

3.3 REPLACEMENT AND CLEANING

A. Replacement: Glass broken or glass damaged before completion of the building operations shall be replaced with glass of the like kind and quality at no cost to the Owner.

B. Cleaning: Upon completion of all construction work and approval of all glazing installations, remove from the glass surfaces, surrounding framing materials and mirrors all labels, sealant and caulking compound smears, spots, etc. Do not use cleaning materials or agents which will damage glass or surrounding surfaces. After cleaning, wash all glass and mirrors completely.

END OF SECTION

SECTION 08 88 13

FIRE RATED GLASS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-rated glazing materials installed as vision lights in fire-rated doors.

B. Related Sections include the following:
   1. Section 08 11 00: Metal Doors and Frames
   2. Section 08 14 16: Wood Doors

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM): ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. American National Standards Institute (ANSI): ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC): CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252 – Fire Tests of Door Assemblies.
   3. NFPA 257 – Fire Tests of Window Assemblies.

F. Underwriters Laboratories, Inc. (UL):
   1. UL 9 – Fire Tests of Window Assemblies.
   2. UL 10B – Fire Tests of Door Assemblies.
   3. UL 10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Submit in accordance with 01 33 00

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components.
   1. Samples: Submit samples for finishes, colors and textures.
   2. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

1.4 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.

C. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to specified destinations in manufacturers or distributor's packaging undamaged, complete with installation instructions.

B. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.6 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design is FireLite Plus® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com

B. Approved alternates per 01 60 00

2.2 PERFORMANCE REQUIREMENTS

A. Fire-rated glass ceramic clear and wireless glazing material listed for use in doors with fire rating requirements of 90 minutes with required hose stream test.

B. Passes positive pressure test standards UL 10C.

2.3 MATERIALS – GLASS

A. Properties
   1. Thickness: 5/16 inch overall.
   2. Weight: 4 lbs./sq. ft.
   3. Approximate Visible Transmission: 85 percent.
   4. Approximate Visible Reflection: 9 percent.
   5. Fire-rating: 90 minutes
   6. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
   7. STC Rating: Approximately 38 dB.
   8. Positive Pressure Test: UL 10C; passes

B. Labeling: Permanently label each piece of glass with UL logo and fire rating).

C. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings to meet IBC requirement of D-H-90

2.4 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Contractor to utilize Putty or Sealant as recommended by the manufacturer for the installation and fire rating.

B. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

C. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.5 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.2 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 INSTALLATION

A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

F. Install removable stop and secure without displacement of tape.

G. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.

H. Install in vision panels in fire-rated doors to requirements of NFPA 80.

I. Install so that appropriate UL markings remain permanently visible.

3.4 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-load bearing metal studs and accessories for wall assemblies.

B. Wood Blocking for wall-mounted items.

1.2 RELATED SECTIONS

A. Section 09 29 00 - Drywall: Gypsum interior sheathing.

1.3 REFERENCES

A. AISI - Standard for Cold-Formed Steel Framing General Provisions.

B. AISI - North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members - 2001.

C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

E. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

F. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members - 2006.

G. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

H. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

K. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

L. ASTM E 413 - Classification for Rating Sound Insulation.

M. GA-600 - Fire Resistance Design Manual.

1.4 DESIGN REQUIREMENTS

A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members" or the North American Specification for the Design of Cold-Formed Steel Structural members, except as otherwise shown or specified.

B. Design loads: As indicated on the Architectural Drawings. 5 PSF minimum design lateral load is required for interior walls by the building code.

C. Design framing systems to withstand design loads without deflections greater than the following:
   1. Interior Non-Load Bearing Walls: Lateral deflection of: L/240.

D. Design framing system to accommodate deflection of primary building structure and construction tolerances.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit manufacturer's product literature and data sheets for specified products.

C. Manufacturer's certification of product compliance with codes and standards.

1.6 QUALITY ASSURANCE

A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.

B. Contractor to conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installing.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C754 section 8.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. ClarkDietrich Building Systems, 9100 Pointe Drive, Suite 210, West Chester, OH. Phone: 513-870-1100. www.clarkdietrich.com, info@clarckdietritrich.com.
2. Other manufacturers as referenced in this section for specific products.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

C. All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA), Steel Framing Industry Associates (SFIA), or the Certified Steel Stud Association (CSSA).

2.2 MATERIALS

A. Steel: Galvanized Steel meeting or exceeding the requirements of ASTM A 1003.

1. Coating: Galvanized G40 coating minimum or equivalent, complying with ASTM C 645. **Stud finish MUST be hot dipped galvanized. Galvanneal finish is not acceptable.**

2.3 COMPONENTS

A. Nonstructural Studs:
1. Flange Length: 1 1/4 inch (32mm) 125 flange.
2. Web Depth: As indicated on drawings.
3. Minimum Material Thickness: Gauge as required by stud legend shown on drawings.
4. Punch Outs: 12 inches (305mm) from base and every 48 inches (1219mm) thereafter.

B. Nonstructural Track: Cold-Formed galvanized steel runner tracks
1. Flange Length: 1 1/4 inch (32 mm) T125 flange.
2. Web: Track web to match stud web size.
3. Minimum Material Thickness: Unless noted otherwise on drawings match stud gauge.
4. Minimum Material Thickness: Track thickness to match wall stud thickness.

C. Deflection Track: Cold-Formed Deep Leg Runner Slotted Slip Track.
1. Leg Length: 2 inch (51 mm) T200 flange.
2. Leg Length: 2 1/2 inch (63 mm) T250 flange.
3. Leg Length: 3 inch (76mm) T300 flange.
4. Leg Length: 3 1/2 inch (89 mm) T350 flange.
5. Leg Length: As required by design.
6. Minimum Material Thickness: As required by design.
7. Minimum Yield Strength: 33ksi (227 MPa) (for 33mils through 118mils).
8. Minimum Yield Strength: 50ksi (345 MPa) (optional for 54mils and up).
9. Minimum Yield Strength: As required by design.

D. U-Channel (CRC Cold Rolled Channel):

E. Furring Channel: Furring existing walls and suspended ceiling applications.
1. Size: 087F125-30 7/8 inch (22mm) Furring Channel 30mils (20ga Drywall).
2. Size: 087F125-33 7/8 inch (22mm) Furring Channel 33mils (20ga Structural).
3. Size: 150F125-30 1 1/2 inch (38mm) Furring Channel 30mils (20ga Drywall).

4. Size: 150F125-33 1 1/2 inch (38mm) Furring Channel 33mils (20ga Structural).

F. Framing Accessories: Provide accessories as required in this project.
   1. Flat Strapping for Backing Strip.
   2. Flat Strapping and bridging for lateral bracing.
   3. L-Angles.
   4. SwiftClip Fixed Connection Angles.
   5. Deflection Slip ConnectorsClarkDietrich™ Building Systems-Deflection Clips: Fast Strut™ / Fast Top™ Clips / FastClip™ Slide Clips / QuickClip™ / Slide Clip™ (SD), or approved alternate. Provide clip as required for each situation to compensate for deflection of structure.

G. Fasteners: Self-drilling, self-tapping screws; complying with ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

H. Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

PART 3 EXECTION

3.1 INSPECTION

A. Inspect supporting substrates and structures for compliance of proper conditions for installation and performance of the cold-formed structural framing.

3.2 PREPARATION

A. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the cold-formed structural framing.

3.3 COORDINATION WITH OTHER TRADES

A. It will be a requirement of this section to verify and coordinate work with other trades and specification sections. Do not begin work on concrete slabs on grade or elevated concrete slabs until minimum strength and cure time has been reached.

3.4 FABRICATION

A. Prior to fabrication of framing, submit product submittal sheets to the architect or engineer to obtain approval.

B. Framing components may be preassembled into panels prior to erecting. Prefabricate panels so they are square, with components attached in a manner which prevents racking and minimizes distortion during lifting and transport.

C. Cut all framing components square for attachment to perpendicular members or as required for an angular fit against abutting members.

D. Plumb, align and securely attach studs to flanges of both upper and lower runners, except that in the case of interior, non-load bearing walls where studs need not be attached to upper or lower runners.

E. Splices in members other than top and bottom runner track are not permitted.

F. Provide temporary bracing where required, until erection is complete. Fastening of components shall be with welding or with minimum 1 #8 screw both sides of flange. Welds shall conform to the requirements of AWS D.1.1, AWS D.1.3 and AISI Manual Section 4.2. All welds shall be touched up using zinc-rich paint. Wire tying will not be permitted.

G. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of load bearing studs will not be permitted.

H. Install headers in all openings in axially loaded walls that are larger than the stud spacing in the wall. Form headers as shown on drawings.

I. Unless shown otherwise on drawings, brace top of metal stud walls to structure above at max. 4'-0" O.C. with minimum 20 gauge stud bracing.

J. Insulation equal to that specified elsewhere shall be provided in all double jamb studs and doubled headers not accessible to insulation contractors.

K. Care should be taken to allow for additional studs at intersections, corners, doors, windows, steel joists, diagonal bracing and as called for in the shop drawings.

3.5 INSTALLATION – DEFLECTION TRACKS AND DEFLECTION SLIDE CLIPS

A. Unless noted otherwise, deflection tracks are to be installed at top of interior and exterior walls terminating directly below and/or attaching to beams joists, roof or floor deck, purlins, or other items subject to deflection.

B. Provide deflection slip connectors attached to stud walls from structure where studs extend vertically past a structural item such as but not limited to a beam or elevated floor edge angle.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before substantial completion of final installation.

END OF SECTION

SECTION 09 29 00

DRYWALL

PART 1 GENERAL

1.1 SUMMARY

A. Furnish materials and labor to complete installation of all interior drywall and miscellaneous metal trim items as indicated on plans and specified herein.

B. Gypsum board surface texturing

C. Reveal Moldings

D. Wood Blocking

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.3 RELATED SECTIONS

A. Section 09 22 16 – Non-Load Bearing Metal Stud Wall Framing

B. Section 09 91 00 - Painting

1.4 REFERENCES

A. ASTM C1396-Standard specification for gypsum board

B. ASTM E90- Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements (ISO 140, Part 3)

PART 2 PRODUCTS

2.1 MATERIALS

A. All gypsum board shall be type “X” fire code, manufactured by Gold Bond, USG, or CertainTeed. Thickness as indicated on drawings. Provide water-resistant in damp areas and where called for. All gyp board shall be installed in accordance with manufacturer's printed instructions and as specified herein. Use water resistant materials in shower areas.

B. Gypsum board thickness
1. Unless noted otherwise in this specification or on drawings, gypsum board thickness to be 5/8”.

C. Reveal moldings (Fry Reglet or approved alternate.)
1. Where new gypsum board terminates at existing CMU, provide series “DRMF”, ½” wide reveal. Depth to be gypsum board thickness.
2. Where new gypsum board terminates at new CMU, provide series “DRMZ”, ½” wide reveal. Depth to be gypsum board thickness.
3. Where new gypsum board terminates at existing gypsum board, provide series “DRM”, ½” wide reveal. Depth to be gypsum board thickness.
4. Finish to be clear anodized.

PART 3 EXECUTION

3.1 INSTALLATION

A. Painted Gypsum Board:
1. In areas calling for painted gypsum wallboard 5/8 thick, apply with length parallel to the studs in lengths sufficient to extend from floor to ceiling with no horizontal joints.
2. Attachment to be by screws 12 inch o.c. in the field and 8 inch o.c. along vertical abutting edges, and 7 inch o.c. on ceiling areas. Type `X' shall be attached 7 inch o.c. edges, ends, and field.
3. All taping and texture shall be done in accordance to printed instructions as supplied by Gold Bond and approved by the Architect. All texture shall be approved by the Architect before proceeding with the work.
4. Provide metal “J” mold where edge of gypsum board abuts a different material or edge of gypsum board is to remain exposed.
5. All painted gypsum board will be textured per this specification unless noted otherwise.

B. Stud Framing
1. Align floor and ceiling tracks to assure plumb partition. Secure the track with suitable fasteners at 24" O.C. maximum. Stud spacing to be 16" o.c. for door and window openings up to 4'-0" wide, reinforcing shall occur through use of a 20 gauge stud screw attached to frame anchors. On openings 4'-0" wide and over, use 2-20 gauge studs back to back against frame and securely attached.

3.2 GYPSUM BOARD SURFACE TEXTURING

A. Where exposed to view, provide light “orange peel” gypsum compound texture on gypsum board surfaces and where called for on drawings unless noted otherwise.
1. Provide two 2’ x 2’ mockup boards with both light orange peel finish for Architect’s and Owner’s review and approval.

B. Texture to be uniform on walls throughout work.

C. Contractor to apply orange peel texturing to sample mockup panel and be approved by Architect prior to any further application

3.3 CONTROL JOINTS

A. Galvanized metal control joint, Model 093 by USG or approved alternate.

B. Control joints are to be provided at approximately 30’-0” o.c. horizontally and vertically at wall installations. Joints should be located at corner of door or window heads if spacing allows and where shown or called for on drawings. These shall be considered minimum requirements.

C. Drywall contractor will repair any cracks in drywall for the one-year warranty period.

3.4 WOOD BLOCKING

A. Install 2 x wood blocking in walls where concealed behind drywall for anchoring of wall-mounted items such as (but not limited to) wall mounted door hardware, etc. **Metal plate backing will not be accepted for anchoring of wall-mounted items.**

B. Provide blocking treated for fire resistance where required by code and as specified or called for.

3.5 CLEAN-UP

A. The Contractor shall be responsible for complete clean up on his contract at completion of same.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL TILE CEILINGS

PART 1 GENERAL

1.1 DESCRIPTION

A. Furnish labor, materials, tools, equipment, scaffolding devices and incidentals necessary or required to install all acoustical tile ceilings and suspension system where shown or scheduled on the drawings.

1.2 RELATED WORK

A. Gypsum Wallboard: Section 09 29 00

B. Air Distribution Systems: Division 23

C. Lighting: Division 26

1.3 REFERENCES

A. ASTM E1264 – Classification for Acoustic Ceilings

B. ASTM E84 – Surface Burning Characteristics

C. ASTM C367 – Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels

D. ASTM C423 – Sound Absorption

E. ASTM C636 – Standard Practice for Installation of Metal Suspensions Systems for Acoustical Tile and Lay-In Panels

F. ASTM E1414 – Sound Attenuation

G. 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources. Using Environmental Chambers – Version 1.1 – California

H. ASTM C518-10 – Thermal Transmission Properties

1.4 SUBMITTALS:

A. Comply with Requirements of Section 01 33 00.

B. Submit through Contractor to Architect:

1.5 SAMPLES

A. Submit one 6 inch x 6 inch piece of each type of acoustical tile to Architect for approval.

B. Label tile with manufacturer's name, light reflection and noise reduction coefficient, flame spread rating and locations to be installed.

C. Submit a sample of adequate size to show all component parts of the suspension assembly, including perimeter angles.

1.6 ACOUSTICAL PERFORMANCE

A. Acoustical ceiling tiles in academic and office areas to have a minimum noise reduction coefficient (NRC) rating of 0.55 and a minimum ceiling attenuation class (CAC) rating of 35.

1.7 GUARANTEE

A. Acoustical ceiling boards shall have a manufacturer’s limited system performance warranty against warping, shrinking or sagging, for minimum Thirty (30) years from date of final acceptance of the building. Grid system to be carry a manufacturer’s Thirty (30) year guarantee.

B. All work under this section shall be guaranteed free from defects in materials and workmanship for a period of one (1) year from date of final acceptance of the building, except where longer periods of time are specified.

C. If during the material guarantee period, shrinkage, buckling or warping of acoustical ceiling occurs, tighten all joints, replace defective acoustical boards as required to maintain tight, neat ceiling.

PART 2 PRODUCTS

2.1 MATERIAL

A. Acoustical Tile Ceiling

Acoustical tile ceilings as called for on plans to be exposed grid system, 24" x 48" x 5/8" non-combustible, mineral fiber, white ceiling board with factory applied white vinyl washable latex paint. USG Radar ClimaPlus, non-directional pattern, Armstrong Fissured HumiGuard Plus, or approved alternate, Class 'A', flame spread of 25. NRC rating: 0.55 CAC rating: 35. Panels contain a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew.

B. All suspended ceilings systems shall be grid system as manufactured by USG-Donn DX-24, Armstrong or approved equal manufacturer. Provide Donn ZXLA or approved equal for areas where vinyl covered gypsum board lay-in panels are called for. Components shall be formed from cold rolled steel, electrozinc coated and prepainted white. Main tee shall be double web

design, .020 gauge, 1 1/2" in height. Wall angle shall be hemmed edge .024 gauge for galvanized grids. Equals: Chicago Metallic 200 series, Prelude 15/16" exposed tee system by Armstrong World Industries, Inc,or approved alternate.

C. Provide hold down clips on all ceiling tile installed within 12 feet of an exterior door.

PART 3 EXECUTION

3.1 HANDLING OF MATERIALS

A. Deliver materials to job in manufacturer's original containers, properly store and protect before, during and after installation. Damaged or defective materials shall be removed and replaced.

3.2 EXAMINATION OF EXISTING CONDITIONS

A. Contractor shall be responsible for examination and acceptance of all surfaces and conditions affecting installation of suspension system and acoustical ceilings. Unsatisfactory conditions shall be corrected before proceeding with the work.

B. Start no work until glazing is complete, exterior openings closed in, cement work, plastering or other wet work is completed and dried out. **HVAC SYSTEM MUST BE IN PLACE AND PROPERLY OPERATING BEFORE ANY CEILING TILE IS INSTALLED**

C. Uniform temperature of 60 degrees F. minimum shall be maintained before, during and after acoustical material installation. Humidity level shall not be any more that what is required by manufacturer’s instructions for installation.

3.3 INSTALLATION OF SUSPENDED SYSTEMS

A. Exposed grid suspension system:
   1. Wall molding shall be attached to all perimeter walls in accordance with manufacturer's recommendations.
   2. Main runners shall be attached to structure with No. 12 gauge hanger wires spaced not more than 4'-0" on center in one direction and 4'-0" on center in the other.
   3. Suspended drywall tees or framing shall be attached to structure with No. 12 gauge hanger wires spaced not more than 2'-0" on center in one direction and 2'-0" on center in the other.
   4. Cross tees shall be installed at 24" on center and mechanically fastened to main runners.
   5. The suspension system shall be installed to permit border units of the greatest possible size, but no less than 4” wide.
   6. All members shall be aligned for true, level surface and straight lines.

3.4 INSTALLATION OF ACOUSTICAL TILE CEILINGS

A. Install units to sub-surfaces from set out points and to pattern shown. Verify location of work of other trades so their items occur within a whole unit or at joints as shown. Make cutouts for recessed items provided by other trades.

B. Provide additional hangers at two adjacent corners of 2'x 4' light fixtures. Provide two at each strip fixture or incandescent fixture.

C. Install units in place, fitting snugly. Provide spacers or hold-down clips where required and within 12' of exterior doors.

D. Paint all rivets exposed to view to match suspension system finish. After installation, clean any soiled surfaces. Replace any damaged units.

E. EXTRA STOCK: At project completion, provide one additional box of each type of acoustical unit specified, for maintenance use by the owner. These tiles are not to be used to replace tiles damaged as a result of failure of other items under warranty (i.e. roofing systems, HVAC systems, etc.)

3.5 CLEANING

A. Following installation, clean soiled and discolored surfaces of units.

B. Remove and replace units which are damaged or improperly installed. Do not use owner’s extra stock for replacing damaged ceiling tiles damaged during construction and damage resulting from failed building components or assemblies during the warranty period.

END OF SECTION

SECTION 09 65 16

RESILIENT HOMOGENEOUS VINYL SHEET FLOORING

PART 1 PRODUCTS

1.1 SUMMARY:

A. Section includes Resilient Honogeneous Vinyl Sheet Flooring and rubber base.

1.2 SUBMITTALS:

A. Comply with Requirements of Section 01 33 00

B. Submit through General Contractor to Architect:
   1. Samples: Provide properly identified, actual samples of each material for approval and color selection prior to installation.
   2. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping and re-waxing.

1.3 QUALITY ASSURANCE:

A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the flooring materials specified.

1.4 DELIVERY AND STORAGE:

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F.

1.5 PROJECT CONDITIONS:

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

B. Install resilient products after other finishing operations, including painting, have been completed.

C. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

D. Maintain the ambient relative humidity between 40% and 60% during installation.

E. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F.

PART 2 PRODUCTS

2.1 MATERIAL

A. Homogenous Vinyl Sheet Flooring
   1. Tarkett iQ Granit
   2. Other manufacturers or series only if approved by Architect as per Supplemental Conditions.
   3. Sheet Standard: ASTM F1913, Standard Specification for Vinyl Sheet Floor Covering Without Backing.
   4. Thickness/Wearlayer: 0.080 inch

   5. Colors and Patterns: As selected by Architect from full range of industry colors

   6. Test data:
      a. Flexibilty (ASTM F137): Passes
      b. Chemical Resistance (ASTM F925): Passes
      c. Static Load Limit (ASTM F 970): Passes 250 psi
      d. Resistance to Heat (ASTM F1514): $\Delta E \leq 8$
      e. Resistance to Light (ASTM F1515): $\Delta E \leq 8$
      f. Residual Indentation (ASTM F1914): Passes
      g. Static Coefficient of Friction (ASTM D 2047): ≥ 0.5 SCOF
      h. Flamability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm^2)
      i. Limited Commercial Warranty: 20 years

   7. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation.

   8. Adhesives: As recommended by manufacturer to meet site conditions

B. Coved Rubber Base
   1. Johnsonite/Tarkett “Traditional” coved wall base, Approved Alternate
   2. ASTM F-1861, Type TP or better, group 1 (solid); 4" high, 1/8" thickness; class C fire resistance, with matching pre-molded outside corner units; top-set coved base; color as selected by Architect. Pre-molded corner units to match exactly, rubber base color selected. **“Preformed” outside corners will not be allowed. Pre-molded outside corners must be provided.**
   3. Provide base material in continuous rolls.

4. Adhesive: Porous surfaces: Tarkett #960 Acrylic Cove base Adhesive; Non-porous surfaces: Tarkett #945 Contact Bond Adhesive. Provide adhesives for approved alternate products as approved by manufacturer for each substrate application.

2.2 ACCESSORIES:

A. Vinyl to Concrete: Bevel Reducer Cap, Etched Aluminum, Manufactured by Powerhold

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify concrete floors are dry and clean and meet acceptance for installation per manufacturer's requirements. Moisture testing of concrete slabs is required to be performed to determine in-situ Relative Humidity (RH) prior to resilient floor covering installation. Perform test following industry standards.Do not proceed until satisfactory conditions have been achieved. Test reports are to be sent to Architect.

B. Due to the many additives being used in or on concrete slabs. A bond test is to be performed prior to actual installation of resilient flooring to determine adhering quality. Some treatments could repel adhesive.

C. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION:

A. Prepare substrates according to manufacturer's written instructions to ensure proper adhesion of Resilient Flooring.
   1. Prepare concrete substrates in accordance with ASTM F 710.
      a. Concrete floors must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitence, mold, mildew, and other foreign materials that may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.
      b. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
      c. Perform moisture testing as recommended by manufacturer. Proceed with installation only after substrates have been tested and meet the minimum requirements from the manufacturer in accordance with ASTM

F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

d. A pH test for alkalinity must be conducted on the concrete floor prior to installation with results between 7 and 9. If the test results are not within the acceptable range, then installation must not proceed until the problem has been corrected.

B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 INSTALLATION

A. RESILIENT SHEET FLOORING:

1. Comply with manufacturer's written instructions for installing resilient sheet flooring.
2. Install with manufacturer adhesive specified for the site conditions and follow adhesive label for proper use.
3. Install rolls in sequential order following roll numbers on the labels.
4. Reverse non-pattern sheets as referenced in the manufacturer's Installation Instructions.
5. Roll the flooring in both directions using a 100 pound three-section roller.
6. Vinyl sheet flooring must be heat welded.

B. BASE MATERIAL:

1. Areas to receive base will be clean, fully enclosed, weathertight and temperature maintained at 65 degrees F for a minimum of three days before installation begins and 48 hours prior to and after installation. This also includes adhesives, which will be conditioned in same manner. Use only Adhesive that is approved by rubber base manufacturer for specific substrate application.
2. Coiled wall base will be uncoiled and laid out flat for at least 24 hours at 65 degrees.
3. Installer to verify substrate rubber base is to be adhered to and coordinate with other trades. Do not install epoxy paint where rubber base is to be installed.
4. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints. Install continuous rolls with as few joints as possible. Use pre-molded corner units.
5. Install base on solid backing. Bond tight to wall and floor surfaces.
6. Scribe to fit door frames and other interruptions.

7. Install pre-molded corner units on all outside corners. Do not extend continuous base around outside corners unless approved by Architect.
8. Base will be mitered at all inside corners.
9. Pieces of base less than 8" not allowed.
10. Install at toe space at base of all cabinets unless otherwise shown.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

3.5 CLEANING AND FINISHING:

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Remove adhesive and other blemishes from exposed surfaces.

C. Sweep and vacuum surfaces thoroughly. Damp-mop surfaces to remove marks and soil.

D. Wait 72 hours after installation before performing initial cleaning.

END OF SECTION

SECTION 09 91 00

PAINTING AND FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. The work to be completed under this heading includes all labor, materials, equipment, and services necessary for and reasonably incidental for painting throughout the building, both exterior and interior, for all wood, metal, masonry, or other surfaces as specified, to make a thoroughly complete job in every respect.

B. Term "exposed" used herein refers to surfaces exposed at exterior of building and surfaces visible within building unless specifically called out. Materials in pipe chases, pipe tunnels and concealed above finish ceiling shall not be considered "exposed".

C. Items included but not limited to - Exposed concrete surfaces (as called for on the interior finish schedule. Exposed concrete masonry units, interior and exterior. Exposed ferrous metals at exterior and interior of building not specified to receive factory applied finish of baked-on enamel. Concealed ferrous metals, except for fasteners and electrical and mechanical items, shall have minimum of one coat of corrosion-resistant paint. Exposed aluminum: galvanized steel roof vents, exhaust fans, grilles and registers shall not be painted unless otherwise designated.

D. Where vinyl-faced roof or wall insulation is provided in pre-engineered structures or similar installations, do not paint vinyl facing.

E. Exposed insulated piping, ductwork and mechanical equipment shall be painted unless supplied from the factory with a finish coat in compliance with building decor and this specification.

F. All exposed flues, vents, and extensions above prefinished metal roofs to be painted to match metal roof color.

G. There shall be no painting of copper, prefinished aluminum, or other finished metal, except iron.

H. Refer to section 09 29 00 for gypsum board surface texturing.

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Follow manufacturer's recommendations for temperature range in which coatings may be applied.

B. Comply with National Volatile Organic Compound Emission Standards for Architectural coatings, Rule 40 CFR, Part 59, established by Environmental Protection Agency for VOC limits unless stricter local regulations are required.

1.4 PAINTING AND FINISHING PRE-INSTALLATION MEETING

A. Prior to any wall or ceiling preparation, Contractor will schedule a pre-installation meeting. Required attendance will be Contractor, Architect, Painter and drywall finisher, and suspended ceiling installer Contractor to conduct meeting.

B. Discussion items:
   1. Gypsum board texturing and mockups
   2. Paint application.
   3. Protection of floors and surrounding finished items and finishes.
   4. Progression of installation following application of finished coat of paint. (i.e. switch and receptacle covers, millwork light fixtures, etc.)
   5. Finishing of hollow metal doors and frames. (spray finish, not brushed.)
   6. Transparent finishes for woodwork, wood doors, etc.
   7. Other discussion items

PART 2 PRODUCTS

2.1 MATERIALS

A. All paint and stain shall be manufactured by Sherwin Williams as specified.
   1. Substitutions: None allowed.
   2. All colors shall be as selected by the Architect if not called out on drawings or specifications.

B. All paint materials shall be delivered to the job in original unbroken manufacturer's packages with the labels intact and be kept in a locked room to which the Architect shall have access at all times.

C. All materials shall be the best of their respective kinds and thoroughly mixed in the proper proportions to secure the best results.

2.2 SAMPLE PANELS

A. After painters' materials have been approved and before any painting or finishing is done, submit panels as follows:
   1. Panels showing color and texture of finish coat.
   2. Panels showing clear finishes.

B. Panels to show color: Composition board, 4 inch by 11 inch by 1/8 inch to show each color selected.

C. Attach labels to each panel stating where material is to be used, mfg. of finish material, and color or number of finish.

2.3 PAINTING AND FINISHING SCHEDULE

A. **Paint Schedule provides for minimum two-coat application in addition to primer or filler coat.** Additional coat may be required for certain items to give complete coverage and uniform appearance. Omit primer for items shop primed.

2.4 EXTERIOR FINISHING SCHEDULE:

A. Ferrous Metal:
1st Coat: Sherwin Williams SW Pro-Cryl B66-310 primer.
2nd & 3rd Coat: Sherwin Williams Pro Industrial Acrylic Coating, gloss B66-660.

B. Galvanized Metal:
1st Coat: Sherwin Williams SW Pro-Cryl B66-310 primer.
2nd & 3rd Coat: Sherwin Williams Pro Industrial Acrylic Coating, gloss B66-660.
1. Paint inside galvanized surfaces of guttering.

C. Exterior Masonry:
1. Painted Finish: Refer to Section 09 97 26 - Special Coatings at CM
2. Clear Water Repellent Finish: refer to section 07 19 00 – Water Repellent Coatings at Brick

2.5 INTERIOR FINISHING SCHEDULE:

A. Ferrous Metals:
1st Coat: Sherwin Williams SW Pro-Cryl B66-310 primer.
2nd and 3rd Coat: Sherwin Williams SW ProMar 200 Acrylic-Alkyd Semi-Gloss B34-8200.

B. Gypsum Board: After application of approved texture.
1st Coat: Sherwin Williams ProMar 200
0 VOC Primer B28W2600
2nd & 3rd Coat: Sherwin Williams ProMar 200 0 VOC Low Gloss Egg Shell B24-2600.

C. Concrete Unit Masonry:
1st Coat: Sherwin Williams SW PrepRite Block Filler B25W25.
2nd & 3rd Coat: Sherwin Williams ProMar 200 0 VOC Low Gloss Egg Shell B41-2600.
1. Back roll both filler and paint coats to ensure good coverage.

D. Concrete Floors (Sealer)
   1. Clear Sealer
      a. Two coats –MasterKure CC 250SB by BASF, semi-gloss, or approved alternate.

PART 3 EXECUTION

3.1 MATERIAL AND SPACE CONDITIONS

A. Do not apply to wet or damp surfaces. Wait a minimum of 30 days or more as required by paint manufacturer before applying to new concrete or masonry. Follow manufacturer's procedures to apply appropriate coatings prior to 30 days to other substrate surfaces. Painter is required to test new concrete or masonry for moisture content prior to beginning of painting with a certified digital PH testing meter approved by Architect. If moisture content is above manufacturer's minimum, surface must be allowed to dry to within levels required by paint manufacturer.

B. Interior of building must be dried in prior to painter primer application. Do not begin painting of surface when temperature is at or below or temperature is predicted to drop below that required by paint manufacturer before required paint drying period.

3.2 SURFACE PREPARATION

A. General: Temporarily remove items interfering with surface to be painted for complete painting of such items and adjacent areas.
   1. See other sections of the specifications for requirements for surface conditions and prime coat.
   2. Surfaces to be finished shall be dry, clean, smooth and prepared as specified.
   3. Materials and methods used for cleaning shall be compatible with the substrate and specified finish. Remove any residue remaining from cleaning agents used.
   4. Method of surface preparation is optional provided results of finish painting produce solid even color and texture specified.

B. Wood: Sand to a smooth even surface and then dust off.
   1. Where transparent finish is specified, finish sanding shall be with 220 grit sandpaper. Wipe surface with a tack rag prior to applying finish.
   2. Surfaces showing raised grain shall be sanded smooth between each coat.
   3. After application of prime or first coat of stain, fill all cracks, nail and screw holes, depressions and similar defects with patching compound. Sand to make smooth and flush with surrounding surface.
   4. Before applying finish coat, reapply patching compound if required, and lightly sand surface to remove surface blemishes.

C. Steel and Iron:
   1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter by use of solvents, emulsions, cleaning compounds, or by steam cleaning.

2. Verify that all factory or field welds where exposed have been grinded to achieve smooth consistent surface and that primer has been applied on bare steel. Apply appropriate filler material where voids occur at welds and finish to achieve smooth consistent surface.
3. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, except where high temperature aluminum paint is used, the surface shall be prepared in accordance with the manufacturer's instructions.
4. Fill all dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with patching compound. Finish flush with adjacent surfaces.
5. Spot prime all abraded and damaged areas in shop prime coat which expose the bare metal, with same type of paint used for prime coat. Feather edge of spot prime as required to produce smooth finish coat. Spot prime all abraded and damaged areas which exposed the bare metal of factory finished items with paint as recommended by the manufacturer.

D. Zinc-coated (Galvanized, Metal, Terne-Plate, Zinc, Lead, Aluminum, Copper and Copper Alloys): Prep galvanized surfaces specified to be painted per paint manufacturer's instructions. Surfaces specified to be painted shall be cleaned of all grease, oil and other deterrents to paint adhesion, with toluene, xylene or similar solvents.
   1. Spot prime all abraded and damaged areas of zinc-coating which expose the bare metal, using zinc rich paint on hot-dip zinc-coated items and zinc dust primer on all others.
   2. Spot prime, with red lead prime, all abraded and damaged areas of terne-plate which exposed the base metal.

E. Masonry, Concrete, Cement Plaster and Stucco: Remove all dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
   1. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. The use of solvents, acid, or steam is not permitted.
   2. Remove all loose mortar in masonry work.
   3. Replace mortar and fill all open joints, holes, cracks and depressions with patching compound, finished flush with adjacent surface, with texture to match texture of adjacent surface.
   4. Concrete floors to be stained or sealed shall be etched and prepped per manufacturer's instructions. Allow required time to dry between applications.
   5. Concrete shall have all broken and spalled edged repaired with patching compound to match adjacent surfaces. Remove projections to level of adjacent surface by grinding or similar methods.

F. Gypsum Plaster and Drywall: Remove efflorescence, loose and chalking plaster. Remove dust, dirt, and other deterrents to paint adhesion.
   1. Fill holes, cracks, and other depressions with patching compound, finished flush with adjacent surface, with texture to match texture of adjacent surface.

3.3 APPLICATIONS

A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.

B. Unless otherwise specified, paint shall be applied in three coats, prime, body, and finish.

C. Before application of body and finish coats, surfaces shall be prepped and primed, except as otherwise specified. For primers to be used for field application, see **PRIMERS** paragraph in this specification.

D. Additional field applied prime coats over shop or factory applied prime coats are not required, except for exterior steel which shall have a field applied prime coat in addition to the shop prime coat.

E. Retouch damaged and abraded painted surfaces before applying succeeding coats.

F. Apply each coat evenly and in full covering body.

G. Not less than 48 hours shall elapse between application of succeeding coats except as allowed by the manufacturer's printed instructions, and approved by the Architect.

H. Finish painted surfaces shall have solid even color, free from runs, lumps, brush marks, laps, or other defects.

I. To prevent items from sticking in the shut position, operable items such as access doors and panels, window sashes rolling doors, and similar items shall not be painted when in the closed position.

J. Painted or otherwise finished surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reasons shall be given two coats of primer.

K. Surfaces of finishing woodwork, except shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish shall be given one coat of primer as soon as delivered to the site.

L. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished. Primer shall be same kind of primer specified for exposed face surface.

M. Prime rebates for stop and face glazing of wood, and for face glazing of steel.

N. Paint is to be applied by brush, or roller on all surfaces except metal. SPRAY PAINTING MUST BE USED ON METAL SURFACES AND IS SUBJECT TO THE FOLLOWING:
   1. Spray painting will be allowed if occupied portion of the building completely sealed off and approved by the Architect.

2. Painting materials specifically required by the manufacturer to be applied by spraying shall be so applied.
3. In areas, where paint is applied by spray, all items specified in Article, Work Not To Be Painted, motors, controls, telephone, and electrical equipment, and similar items shall be masked, or enclosed with polyethylene, or similar air tight material with all edges and seams continuously sealed.

3.4 PRIMERS:

A. After surface preparation, apply prime coat to various materials as follows: NOTE: Prime coat is not required for acrylic emulsion and latex emulsion finish.
   1. Steel and iron: Red lead primer
   2. Zinc-Coated Steel and Iron: Zinc dust primer.
   3. Aluminum: Zinc chromate primer.
   4. Lead and Terne Metal: Red lead primer.
   5. Copper and Copper Alloys: Zinc chromate primer
   6. Gypsum Plaster Block Filler: Pigmented sealer, except use latex emulsion for alkyd flat finish.
   7. Cement plaster, Concrete, and Masonry: Latex emulsion except use two coats of latex primer when substrate has aged less than six months.
   8. Drywall: Latex primer, except use pigmented sealer in shower, dressing and locker rooms.

3.5 EXTERIOR FINISHES:

A. On properly prepared and primed surfaces, apply the following finish coats. Prime coat is not required for acrylic emulsion finish.
   1. Metal: Two coats of specified paint.
      a. **NOTE: All metal surfaces to receive paint shall be spray applied. No exceptions!**
   2. Concrete, Concrete Masonry Units: Refer to Section 09 97 26, Special Coatings.

3.6 INTERIOR FINISHES

A. On properly prepared and primed surface, apply the following finish coats. Prime coat is not required on concrete for floor enamel finish.
   1. Metal Work: Apply two coats of specified paint on exposed surfaces, including surfaces of ferrous metal louvers and ferrous metal hardware, except as follows:
      a. Two coats of high gloss sheen specified paint on specified surfaces, color as selected.
      b. Omit body and finish coats on surfaces concealed after installation
      c. NOTE: All metal surfaces to receive paint shall be spray applied. No exceptions!
   2. Plaster: One coat of latex sealer plus two coats of latex satin on exposed surfaces.
   3. Drywall: One coat of latex sealer plus two coats of specified paint on exposed surfaces.

4. Masonry and Concrete Walls: One coat of specified paint over block filler on surfaces where scheduled.
    a. Third coat will be required on surfaces where accent colors are scheduled for adequate coverage.

3.7 TRANSPARENT FINISHES ON WOOD

A. General:
1. Open grained wood such as oak, walnut, ash and mahogany shall be filled with a paste wood filler, colored as required to achieve finish specified. Thin filler accordance with manufacturer's instructions as required for application. Remove excess filler, wipe as clean as possible, allow to dry and sand lightly with 220 grit sandpaper.
2. Stain shall be of type and color required to achieve finish specified. Stains may be used when transparent finishes are specified to change the color of sapwood to match heartwood, and to enhance or even the color of the wood as required to match the finish specified. Varnish or polyurethane type stains will not be allowed.
3. Sealers shall be polyurethane, same as used for top coats, thinned with thinner recommended by the manufacturer at the rate of about one part of thinner to four parts of polyurethane. Sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
4. Sealers and polyurethane shall be sanded between coats. Allow manufacturer's recommended drying time before sanding, but in no case less than 24 hours (36 hours in damp or muggy weather). Sanding shall be done using 220 grit sandpaper. Sand enough to scarify the surface to assure good adhesion of the subsequent coat to level roughly applied sealer and to knock off the "whiskers" of any raised grain as well as dust pinnacles. Sanding blocks shall be used for between coat sanding.
5. Finish application shall be done only in clean areas and in still air. Before finishing, the area shall be vacuumed and dusted. Immediately before applying finish, the surfaces shall be wiped down with a tack rag.

B. Stain Finish: Apply in successive coats as follows:
1. One coat of stain.
2. One coat of sealer.
3. Two coats of satin polyurethane finish.

C. Natural Finish: Apply in successive coats as follows:
1. One coat of sealer.
2. Two coats of satin polyurethane finish.

Note: Individual specification sections or notes on drawings may call for finishes or prefinished items different from what is specified in this section (i.e. factory finished; factory stained, etc.). Unless otherwise called for, abide by those finishes as noted or specified on drawings or specification sections.

3.8 REFINISHING

A. Existing interior and exterior work to be refinished shall include the following:
   1. Interior:
      a. Existing painted surfaces of rooms, areas and spaces in which alterations occur under this contract.
      b. Existing surfaces of rooms, areas and spaces specified to be painted as selected.
      c. All other rooms, areas and spaces noted on the drawings to be refinished.
   2. Exterior: Existing painted surfaces damaged, altered or disturbed as result of work performed under this contract and surfaces specified to be painted, color as selected.

B. Except as otherwise specified or noted on drawings, refinished rooms, areas and spaces shall be refinished as follows:
   1. Patched and damaged surfaces of walls shall receive prime, body and finish coats.
   2. Patched and damaged surfaces of ceilings, except prefabricated acoustical unit ceilings shall receive prime and finish coats.
   3. Undisturbed surfaces of patched and damaged walls and ceilings, except prefabricated acoustical unit ceilings shall receive body and finish coats.
   4. In corridors, paint refinished walls and ceilings to the nearest natural break (ie; corner, reveal, door frame, etc.)

C. Color and texture of paint, and color and texture of stain and varnish for clear finishes on wood shall match existing, unless otherwise selected.

3.9 WORKMANSHIP OF REFINISHED SURFACES

A. Rating work to be refinished shall have surfaces prepared and made smooth before refinishing.

B. Surfaces shall be clean and dry before refinishing.

C. Abraded, peeled and bare spots shall be touched-up before painting or refinishing.

D. Refinishing of existing surfaces shall include preparation of surfaces to receive new finishes including removal of any existing finishes that may preclude application of new finishes. Remove all paint spots from hardware, signs, fixtures, and other similar items not required to be finished.

E. Remove loose particles of dirt, dust, paint film, rust, scale, and similar deterrents to paint adhesion by scraping, brushing, sanding, vacuuming, or other suitable methods.

F. Remove grease, soil, and other deterrents to paint adhesion with a cleaning compound, or solvent compatible with substrate and subsequent coats. The use of solvents, acid, or steam will not be permitted on concrete and masonry. Remove any traces of cleaning agents which will affect paint adhesion.

G. Properly cut out loose or broken glazing compound on glazed doors, sash, etc., to sound material. Clean cut-outs and neatly re-putty with glazing compound.

H. Holes, cracks, and other surface indentations shall be neatly filled with patching compound compatible with substrate and subsequent coats, appropriate for the surface texture required and finished to match adjacent surface texture.

I. Knots, pitch streaks, etc., showing through old finish shall be coated with knot sealer before refinishing.

J. Sand or dull glossy surfaces prior to painting. Sand existing paint to a feather edge so that transition between new and existing finish will not show in the finished work.

K. Workmanship and material shall be equal to that specified for new work of similar character as required to match adjoining work.

3.10 SCAFFOLDS

A. This Contractor shall provide all ladders, scaffolds, staging, etc., required for the proper execution of the work.

3.11 PROTECTION

A. Protect all work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.

3.12 EXTRA STOCK

A. Provide minimum one full gallon of each type and each color of paint specified and used on project. Each paint container to be properly labeled, identifying type and color.

3.13 CLEAN UP

A. Upon completion, clean paint from all hardware, glass and other surfaces and items not required to be painted.

B. Before final inspection, any work which has become damaged or discolored shall be touched-up or refinished in a manner to produce solid even color and finish texture, free from defects.

END OF SECTION

SECTION 09 97 26

SPECIAL COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Masonry Weatherproofing System: Cementitious Waterproofing Coat with Decorative Acrylic Finish Coat.
   2. Protection of weeps, drainage and ventilation vents during coating application.

B. Related Sections:
   1. Section 04 22 00 - Concrete Unit Masonry.

1.2 REFERENCES

A. American Society for Testing & Materials (ASTM):
   1. ASTM D968 - Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester.
   2. ASTM D822 - Operating Light and Water Exposure Apparatus (Carbon Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.
   3. ASTM G26 - Operating Light-Exposure Apparatus (Carbon Arc Type) With and Without Water for Exposure of Nonmetallic Materials.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Properly trained and approved by the weatherproofing system manufacturer and have authorization to offer specified warranty. Submit installer letter of certification, signed by Technical Representative of system manufacturer.

B. Field Sample:
   1. Apply masonry weatherproofing system to sample concrete block panel.
   2. Reflect proposed color, texture, and workmanship.
   3. Obtain acceptance of completed section from Architect before beginning work.

C. Pre-installation Conference:
   1. General Contractor shall arrange meeting no less than seven days prior to starting work.
   2. Attendance:
      a. General Contractor
      b. Coating Contractor
      c. Architect/Owner's Representative
      d. Coating Manufacturer Representative/Distributor.

3. Agenda:
    a. Substrate condition.
    b. Sequence and method of application of coating system.

1.4 SUBMITTALS

A. Comply with Section 01 33 00

1.5 PROJECT CONDITIONS

A. Environmental Requirements:
    1. Do not apply on frozen or frost-filled surfaces.
    2. Do not apply if temperature is below 40 degrees F. or expected to fall below 40 degrees F within 24 hours.
    3. Protect material from freezing.
    4. Protect surfaces from rapid drying where windy, hot, and dry conditions exist.
    5. Protect from precipitation for 24 hours after application.
    6. Avoid applying material during rapid and extreme changes in temperature to prevent thermal shock cracks during the curing process.
    7. The following conditions may require damping the surface prior to and during application.
        a. Wind-caused rapid drying of surface.
        b. Excessive surface temperature
        c. Excessive air temperature
        d. Direct sun
        e. Low humidity.

1.6 WARRANTY

A. Provide five year material and labor warranty to cover:
    1. Waterproofing above grade.
    2. Bonding.
    3. Weathering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide coatings of the following manufacturers:
    1. Master Builder Solutions by BASF (formerly Thoro System Products)

B. Substitutions: Must be submitted to the Architect for review prior to bidding.

2.2 CEMENTITIOUS WATERPROOFING AND ACRYLIC FINISH COATINGS

A. Master Builder Solutions, by BASF
   1. Master Seal 581 (Cementitious Waterproofing Coating)
   2. Master Protect C250 (Acrylic Finish Coating)
B. Custom color to match adjacent precast finish

2.3 MIXING

A. If premixing is required, stir in strict accordance with printed instructions of manufacturer. Use approved mechanical mixer. Do not use frozen, caked, or lumped materials.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examination:
   1. Examine substrate to which finely textured coating is to be applied. Do not proceed if unsatisfactory conditions exist which hamper proper application.
   2. Beginning of application means acceptance of substrate condition.

B. Preparation:
   1. Surfaces to receive system shall be free of defects such as honeycombs, form marks, tie holes, concrete dropping, laitance, dirt, dust, grease, form release treatments, efflorescence, curing compounds, paint and any other foreign material.

C. Patch all cracks and holes with Master Builder Solutions MasterEmaco N424 prior to application of Cementitious Waterproofing Coating.

D. Beginning of application means acceptance of substrate.

3.2 MASONRY WEEP VENT, DRAINAGE VENT AND VENTILATION VENT PROTECTION

A. Weep vents, drainage vents and ventilation vents are not to be coated. Protect as required during coating process.

3.3 APPLICATION

A. General:
   1. Waterproof exterior walls with cementitious waterproofing coating. Ensure surface is thoroughly cured before starting finish application (48-72 hours under normal conditions)

2. Acrylic Coating:
    a. After Cementitious Waterproofing Coating has been applied and cured, apply Acrylic coating. Apply material at a rate recommended by manufacturer, directly as it comes from the can.
    b. Apply material by brush, roller, plaster type sprayer, or low pressure sprayer.
    c. Back roll brushed or sprayed material; cross roll roller-applied material.
    d. Finish material so that brush and roller strokes are on one direction

3.4 FIELD QUALITY CONTROL

A. Unless noted otherwise, new exposed CMU single wythe infill at existing building surfaces shall receive complete and thorough coverage of specified masonry weatherproofing at exterior surface. Color to be selected by Architect.

B. Maintain schedule of application of system in field office for Owner/Architect's review.

3.5 EXTRA STOCK

A. Provide minimum one gallon of each color of special coating used on project. Each container to be properly labeled, identifying color.

END OF SECTION

SECTION 10 00 00

MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all items listed and specified below and where shown on drawings. Install per manufacturer's instructions.
B. Section includes Corner Guards

1.2 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

1.3 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. General: Submittals showing all details of script, fabrication, and installation.

C. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel Corner Guards
   1. Manufacturer: InPro Corporation or Koroseal Interior Products
   2. Height – Custom height from top of rubber base to ceiling unless noted otherwise.
   3. Wing size: 1-1/2" x 1-1/2"
   4. 1/8" radius
   5. 16 gauge, 304 stainless steel
   6. Cement on type attachment

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify that area to receive product is ready for installation.

B. Install items in strict accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 28 13

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. The work to be completed under this heading consists of furnishing all labor, materials, equipment and services necessary for and reasonably incidental to the furnishing and application of all miscellaneous items as shown and as specified.

B. All items shall be delivered in sound condition, properly installed and shall be clean, undamaged, and in proper working order.

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

1.3 REFERENCES

A. Comply with State of Arkansas Adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

PART 2 PRODUCTS

2.1 OWNER FURNISHED TOILET ACCESSORIES:

A. Owner will furnish soap dispensers, tissue dispensers, and paper towel dispensers. These items are to be installed by contractor.

2.2 TOILET ACCESSORIES:

A. Pre-manufactured Wall Mounted Mirrors: (One at each wall-hung lavatory.)
   1. Standard Stainless Steel Mirrors:
      a. Surface mounted, center over each lavatory, 304 stainless steel, satin finish frame with No. 1 quality ¼” glass, mirror warranted against silver spoilage for 15yrs. Galvanized steel back, 18”x36”. Secure to concealed wall hanger with theft-resistant mounting. Mounting height as scheduled on Drawings.
      b. Acceptable Products:
         Bobrick Washroom Equipment, Inc. - Model B-290-1836
         Bradley Corporation, Model 780-1836

B. Grab Bar-Toilet Rooms: (One set at each handicapped water closet.)
   1. 18 gage stainless steel; 1 1/2" diameter, safety grip surface; concealed mounting. One at each handicapped water closet.
      a. Model No. B6806.99 x 42, B6806.99 x 36 & B6806.99 x 18 by Bobrick.
      b. Model No. 8122-00142, 8122-00136 & 8122-00118 by Bradley.

c. Or approved alternate.

PART 3 EXECUTION

3.1 FABRICATION:

A. Stamped names or labels on exposed faces of toilet accessory units are not permitted.

3.2 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit.

B. Install units at location and heights as shown on drawings. Install as to comply with all national, state, and local codes and regulations. Units shall be plumb and level, firmly anchored.

C. Molly-type anchors are not acceptable for securing accessories to walls or partitions. Secure to gypsum board partitions with screws anchored in wood blocking. Anchor accessories to masonry walls with screws set in epoxy.

3.3 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

B. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION

SECTION 10 44 00

FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

A. Work under this heading consists of furnishing all labor, materials, equipment and services necessary to install fire extinguisher as shown or called out on drawings.

1.2 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish multi-purpose dry chemical extinguisher, Larsen MP10, J.L. Industries Cosmic 10E, or approved equal.

B. Provide extinguishers with wall mounted brackets where called for on drawings.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Accurately locate all items, install level, plumb, and true. See Plans for required locations. Rigidly attach to the supporting surfaces in the manner recommended by the manufacturer. Install as required to provide 48” from finished floor to extinguisher handle.

END OF SECTION

SECTION 13 34 19

PRE-ENGINEERED METAL BUILDING SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. The building shall include all primary and secondary structural framing members, connection bolts, roof and wall covering, flashing, gutter, rake trim, downspouts, closures, sealants, insulation and other miscellaneous items as called for on the contract.

B. The building manufacturer shall provide installation and assembly drawings including anchor bolt setting plan, roof plan, elevation, cross section, etc., as required to assemble all parts, components and accessories furnished by the building manufacturer. Drawings shall indicate the piece marks of all parts to be erected or assembled for easy field identification.

C. Refer to Structural Drawings for design load requirements.

1.2 QUALITY ASSURANCE

A. All metal building components, including wall and roof panels shall be warranted by single metal building manufacturer, unless noted or specified otherwise. Pre-engineered metal building manufacturer/supplier shall submit in writing along with his proposed substitution, no later than 10 days prior to bid that he warrants all components as described within this specification.

B. INSTALLER - Metal building manufacturer/supplier must submit proof, in the form of a letter on company letterhead and signed by a representative of the roofing manufacturer, prior to bid, that the metal roofing installer has been approved by the metal roofing manufacturer as an approved installer. Installer must have been an approved installer three months prior to bid date and retain that approval at time of bid.

1.3 REFERENCES

A. SMACNA: "Architectural Sheet Metal Manual", Sheet Metal and Air Conditioning Contractors National Association, Inc.LGSI: "Light Gage Structural Institute"

B. AISC: "Steel Construction Manual", American Institute of Steel Construction, Current Edition.

C. AISI: "Cold Form Steel Design Manual", American Iron and Steel Institute Current Edition.

D. UL580: " Tests for Uplift Resistance of Roof Assembles", Underwriters Laboratories, Inc.

E. FM: "Test requirements for Class 1 panel roofs", Factory Mutual Research Corporation.

F. UL2218: Class 4 Impact Resistance Rating

G. ICBO: Evaluation Report No. ER-5409. ICBO Evaluation Service, Inc.

H. ASTM E 1592-95: "Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference", American Society for Testing and Materials.

I. ASTM E 1680-95: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.

J. ASTM E 1646-95: "Standard Test Method for Water Penetration Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.

K. ASTM E 1514-93: "Standard Specification for Structural Standing Seam Steel Roof Panel Systems", American Society for Testing and Materials.

L. North American Insulation Manufacturer's Association (NAIMA)

1.4 SHOP DRAWINGS AND SUBMITTALS

A. Comply with Section 01 33 00.

B. Product Data: Provide on profiles, component dimensions and accessories.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads, wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method or installation and anchor bolt layout, framing anchor bolt settings, sizes, and locations from datum and foundation loads, indicate welded connections with AWS A2.0 welding symbols; indicate net weld lengths; provide professional seal and signature for state in which project is built.

D. Samples: Submit actual color samples of pre-coated metal panels for each color selected, illustrating color and texture of finish.

1.5 RELATED SECTIONS

A. Section 07 62 10: Gutters and Downspouts

B. Section 07 72 53: Snowguards/Flueguards

C. Section 07 92 00: Sealants

D. Section 08 11 13: Hollow Metal Doors and Frames

E. Section 08 36 13: Sectional Overhead Doors

F. Section 08 71 00: Finish Hardware

G. Section 09 91 00: Painting

1.6 CERTIFICATION

A. Pre-engineered metal building fabricator/manufacturer to be A.I.S.C. Certified.

B. Submit copy of certificate with shop drawings or upon request by Owner or Architect.

1.7 GUARANTEE

A. Installer to guarantee workmanship, durability, and weather-tightness of metal building system, including flashings and other associated items of the metal building system for a period of five (5) years.

B. Provide 20-year weathertight warranty equivalent to Varco Pruden Optima Weathertightness Warranty.

C. A no dollar limit of the manufacturer's Roof System as invoiced to the manufacturer's customer. Warranty requires that a certified installer be on the job site at all times.

D. Painted finish shall be guaranteed for a period of Twenty (20) years, by the panel and metal building manufacturer. A specimen of these warranty documents must be approved by the Architect.

1.8 MANUFACTURER INSPECTION

A. Final inspection by manufacturer's representative is mandatory prior to substantial completion. **Architect to be notified a minimum of 24 hours prior to manufacturer's inspection and be performed in his presence.**

B. Written proof of final inspection by manufacturer's representative is to be included in closeout documents.

C. **It will be mandatory** that the final roof inspection report containing items to be corrected be sent to Architect for his records.

D. Upon acceptance through inspection, a **No Dollar Limit Warranty** will be issued and begin a period of (20) years for the weathertight warranty. **No exceptions**.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers must meet performance requirements as listed in this specification.

2.2 WALL, SOFFIT & ROOF PANELS

A. General
Panels shall be 24 gauge steel (other types of panel material may be used upon approval of Architect. Material for roof panels shall conform to ASTM A-446. Grade E (80,000 psi minimum yield strength). Material for panels shall conform to ASTM A-525, Designation G-90, 50 KSI minimum yield strength. The roof construction shall carry an Underwriter's laboratories construction (uplift) classification of not less than UL Class 90 (UL90).

B. Wall Panel Description ('Tech Four' by VP Buildings or 'Designer Series-Fluted' by MBCI as guideline)
1. Concealed fastener panel, 1'-4" wide coverage.
2. 24 gauge, nominal 2 inch thick profile, male/female edges, concealed fastener system.

C. Roof Panel Description ('SLR II Panel by VP Buildings as guideline)
1. Roof panels shall be designed for loads listed on structural sheet.
2. Roll-formed hot-dip galvanized steel panels, 24 gauge standing seam, 2 inch profile, 16 inches wide, male/female edges, concealed fasteners, seamed together by means of a power closure machine, fitted with continuous gaskets.
3. Provide thermal blocking for roof insulation.
4. Anchoring Clip: Articulating clip, providing thermal expansion or contraction, correcting for out-of-plane sub-framing alignment to a maximum of 7 degrees (UL-90 rated - Underwriters Laboratories).
5. Provide panels in continuous length eave to ridge or in longest lengths possible.

D. Wall & Liner Panels (FW 120-0 flush panel by MBCI as guideline)
1. Material: 24 gauge plain galvanized steel conforming to ASTM A446 Grade A, structural quality, not dipped galvanized 1.25 oz G-90 coating.
2. Concealed anchorage, interlocking joints.
3. Continuous length vertically.

2.3 ACCESSORIES

A. Eave Gutters and Downspouts
1. Eave gutters shall be made from 24 gauge prefinished steel.
2. Downspouts and rake trim shall be 26 gauge prefinished steel rectangular shaped. Downspouts shall have a 45 degree elbow at the bottom and shall be supported by attachment to the wall covering at 10' maximum spacing. Unless otherwise specified, downspouts terminate at the base plate elevation.
3. Rainfall Intensity:
   a. As a minimum, all exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration. Locate downspouts where shown on drawings.

4. Refer to Section 07 62 10 for additional requirements for gutters and downspouts.

B. Metal Building Blanket Insulation: Glass fiber, with factory laminated facing material
   1. Glass fiber: Odorless, neutral colored, long filament, flexible resilient, produced in compliance with NAIMA 202-96.
   2. Flame spread Index: The composite of fiberglass and facing shall have surface burning characteristics not to exceed 25 flame spread when tested in accordance with UL 723 or ASTM E84 test methods.
   3. Smoke Developed Index: not to exceed 50 smoke development when tested in accordance with UL 723 or ASTM E84 test methods.
   4. UL Classified.
   5. Provide facing 3 inches (75 mm) wider than blanket on both edges.
   6. Width: As required for installation.
   7. 6 inches thick at walls, 6 inches thick at roof.
   8. Provide thermal roof clips to accept 6" insulation and provide for thermal movement of panels.
   9. Provide thermal blocking material between roof panels and structure, minimum 1" thick extruded polystyrene or other acceptable product approved by Architect. (Expanded polystyrene is not acceptable.)
   10. The insulation shall be faced with a UL listed vapor retarder of reinforced white material, manufactured by Lamtec Corporation Flanders, NJ (800) 852-6832 or approved alternate Thickness to be 6" at roof and walls. Notch out at girts, removing 3" of insulation.
   11. Install in wall or roof applications as shown on drawings per manufacturer's instructions. Seams shall be taped or tabbed continuously at butt joints and side joints per NAIMA recommendations with insulation manufacturer's approved tape.

C. Hollow Metal Steel Doors and Frames
   1. Refer to Section 08 11 13, Hollow Metal Doors and Frame.

D. Panel End Closures:
   1. Provide metal closures only. Match wall or roof panel profile & finish closures are installed in. No foam closures are to be used. Secure per manufacturer's instructions. Seal completely around perimeter of each closure to provide weathertight fit.
   2. Provide closures for end of rake trim where transitioning from rake to gutter.

E. Sealants
   1. Compliance: Sealant shall meet or exceed requirement of this standard:
      a. ASTM C920, Type S, Grade NS, Class 50, Use NT, T, G, A and I
      b. CAN/CGSB-19 13-M87 – Canadian General Standards Board
      c. ASTM D624: Tear strength – 44.4lbf/in
      d. ASTM D412: Elongation – 300%
      e. ASTM D412: Tensile strength – 210psi
   2. Sealants for side laps, end laps, accessories, etc., shall be a preformed, butyl rubber based compound or Titebond® WeatherMaster™ Metal Roof Sealant. The material shall be non-hardening, non-shrinking and non-corrosive and shall have excellent adhesion to metals, painted surfaces and plastics at temperatures from -30ºF to 160ºF.

These sealants shall be in tape mastic form, of shape and size recommended by panel and trim manufacturer for various applications, and shall have paper backing for easy handling.

3. Tube sealants shall be used to supplement tape mastic sealants and shall be applied in locations indicated by erection instructions. Tube sealant shall be a synthetic, elastomer-based material which becomes tack-free in less than 2 hours at 75ºF but retains flexibility equal to Titebond® WeatherMaster™ Metal Roof Sealant.

F. Snowguards
   1. Refer to section 07 72 53 Snowguards and Flueguards

2.4 SHOP/FACTORY FINISHING

A. Pretreatment - The metal shall be given a pretreatment prior to finishing, consisting of cleaning and creating a chemical reaction to form an inorganic coating for bonding of the finish.

B. Framing Members: Shop primed.

C. Exterior Prefinished Wall Panels and Accessories, Miscellaneous Trim, Gutters, Downspouts, and Rake Trim: Prefinished, Kynar 500, 20 year finish warranty.

D. Wall Panels: Kynar 500 factory painted finish.

E. Roof Panels: Kynar 500 factory painted finish.

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F. Architect to select color from manufacturer's selection, minimum 8 colors for roof panels, wall panels, accessories trim, and all other prefinished metal building items.

2.5 FIELD FINISHING

A. Unless noted otherwise, all pre-engineered metal framing components exposed to exterior are to be painted per Specification Section 09 91 00. This shall include, but not limited all door jambs and heads, extended exposed frame ends and any metal building frame component on an open-air structure.

B. Unless called for on finish schedule of specialty plans, interior framing members shall be factory primed only.

PART 3 EXECUTION

3.1 COORDINATION WITH DESIGN

A. It shall be the responsibility of the pre-engineered metal building manufacturer to coordinate metal building components (i.e. mainframe depths and dimensions, flange brace locations, portal frame dimensions, etc.) with other architectural and structural building components. If metal building components differ from drawings or interferes

with other building components (i.e. ceiling heights, furring around columns, door and windows, etc.), and cannot be adjusted to work with design as drawn, he is to contact Architect immediately prior to shop drawing submission. Every attempt is to be made to coordinate and adjust as needed in order to work with drawings and specifications.

3.2 STRUCTURAL STEEL FABRICATION

A. General Fabrication
   1. All structural steel members shall be factory cut, formed, punched, welded, and prime-coat painted for bolted field assembly. All base plates, cap plates, stiffener plates, and splice plates shall be shop fabricated complete with bolt connection holes. All building parts shall carry an identifying piece mark for easy field identification.
   2. Flanges and webs of built-up welded members shall be joined by a continuous automatic submerged arc-welding process on one side of the web.

B. Primary Structural Members
   1. Steel used in the fabrication of built-up primary structural members shall have a minimum yield of 50,000 psi. Hot-rolled wide flange members shall conform to ASTM A992 with a yield strength of 50,000 psi. All other hot-rolled primary structural members shall have a minimum yield of 36,000 psi.
   2. Primary framing shall be shop fabricated and shall include factory-welded purlin and girt clips. Holes shall be provided by the factory for attachment of secondary members and bracing.
   3. Bearing end wall frames shall be a rigid frame designed for no future expansion. All endwall columns may be used in the support of the endwall beam.
   4. Interior frames shall be substituted for bearing end wall frames when specified
   5. Limit lateral deflection of all columns to H/240 in any direction.
   6. Rigid frame beams shall be designed for a maximum live load deflection of L/360.
   7. No live load reduction will be allowed.
   8. Building will have no future expansion.

C. Secondary Structural Members
   1. Steel used in the fabrication of cold-formed structural members shall have a minimum yield of 55,000 psi. Steel with a minimum yield different from the above may be used on individual members as required by design or as specified.

   2. Purlins and Girts - Purlins and girts shall bolt to clips which are factory-welded to the frames. Purlins and girts shall be precision roll-formed of 16, 14, or 12 gauge steel with a minimum yield of 55,000 psi. Purlins and girts shall be 8" deep "Z" Sections 2 1/2" or 3 1/2" wide flanges with stiffening lips formed at any angle to 50 degrees with the flanges. Deflection of purlins shall not exceed L/240 of its span when supporting the applicable live loads. Deflection of girts shall not exceed L/180 of its span when supporting the applicable design wind loads. Refer to Structural Drawings for collateral, live, wind, and seismic loading.

   3. Eaves Struts - Eave struts shall be "C" sections with one flange cold-formed to suit the roof slope and vertical wall condition and provide suitable fastening surfaces for

both wall and roof sheets. Steel in eave struts shall be 14 gauge minimum yield of 55,000 psi.

4. Wind bracing - Buildings shall be designed to resist wind loads by diagonal bracing consisting of either cables, rods, or angles at roof and walls. Diaphragm action of the wall panels shall not be allowed.

5. Flange Bracing - The inside flange of all frames shall be adequately braced so that the allowable compressive stress is adequate for the design load combination.

6. Base Member - A continuous base member shall be provided to which the base of the wall covering may be attached.

7. Framed Openings - Framing members for all openings shall be adequate for the equipment specified.

8. No live load reduction will be allowed.

D. Structural Coating
All structural steel components shall be factory cleaned to remove all loose dirt, grease, mill scale, and other foreign matter and then coated with standard structural rust inhibiting red oxide primer that meets or exceeds Federal Specification TTP 636.

E. Splices and Connections
1. All structural steel shall be shop punched for bolted field assembly, except for field-located accessories.

2. All bolts for field assembly of primary structural members shall be high strength bolts, indicated on drawings and finish will be electro zinc with bronze chemical chromate conversion coating. All high strength bolts shall conform to ASTM A-325, unless otherwise specified. Bolts for primary structural members shall not be less than 5/8" diameter. Bolts for secondary members shall be 1/2" electro-zinc plated machine bolts conforming to ASTM A-307 unless otherwise specified.

F. Equipment miscellaneous framing.
1. Provide structural support as required Mechanical Equipment and Overhead door bracing.

3.3 INSTALLATION OF WALL AND ROOF PANELS

A. Wall panels shall be continuous from base to eave. If panel lengths exceed manufacturing and shipping limitations, splice shall occur over a wall girt.

B. Roof panels shall be continuous from eave to ridge. If panel lengths exceed manufacturing and shipping limitations, splice end laps shall be installed per manufacturer’s erection details. Sealant shall be used in all roof panel end laps.

C. When specified, all ribbed, roof panel side laps shall be sealed with a field applied, continuous ribbon of tape mastic sealant. Eaves shall also be sealed when specified.

D. Fastener population and pattern for both wall and roof panels shall be as shown on erection details.

E. Roof panels to be installed with thermal clips, allowing a minimum 1" separation between purlin and roof panel.

G. Roof and wall panels to be attached to frame to allow for panel movement from thermal expansion and contraction.

H. Roof and wall panel systems to be weathertight, free from oil canning, waves, warps, buckles, fastening stresses, or any other type of panel distortion.

I. When 6 inch thick wall insulation is provided, remove portion of the batt insulation at each girt to accommodate installation of the insulation.

3.4 FRAMED OPENINGS

A. Framed openings shall be furnished by metal building manufacturer to accommodate Overhead Doors supplied by others. Framed openings shall consist of structural framing to provide a large opening in a wall, along with necessary trim to flash around this opening and provide a finished appearance.

B. Size of opening shall be determined by size of door specified. Structural framing (jambs and header) shall consist of cold-formed, open "C" sections or hot-rolled channel sections depending on structural requirements. Necessary clips and fasteners, for making connections for all members, shall be provided. Trim around opening shall be metal building manufacturer's standard to accommodate wall panel configuration. (Door track supports by door supplier).

C. Provide color-coated trim to entirely cover shop-primed structural jambs and header.

3.5 INSTALLATION-GENERAL

A. All components to be erected and installed per pre-engineered metal building manufacturer's instructions. Coordinate installation of other components and substrates to produce watertight assembly capable of withstanding inward and outward loading pressures and thermal and lateral loads.

B. Isolate metals from dissimilar metals or corrosive substrates using bituminous coatings or other means of permanent separation to prevent electrolytic corrosion.

C. Use extra precautions to not mar or damage prefinished panels and components. Leave protective covering on panels and components as long as possible.

D. Provide method of attachment of panels and metal building components to substrate or structure to allow for thermal movement so that oil canning is avoided. Submit details with submittals.

E. Purlins and girts: Alignment of purlins and girts shall vary no more than ¼" at midspan for 20'-0" lengths, measured transverse to purlin/girt span. This shall be checked by stringline from ridge to eave for purlins, and eave to floor line for girts. Verification shall be given to Architect prior to panel installation that these minimum requirements have been achieved. Notify Architect 24 hours prior to verifying alignment.

3.6 ACCESSORIES INSTALLATION

A. Follow metal building manufacturer's instructions for installation of all accessories.

B. Install door frames to form air-tight joints.

C. All items installed in roof and wall panels provided by other trades are to be properly flashed and sealed. It will be the responsibility of the metal building supplier and erector to make these penetrations weathertight. Provide flashing details with shop drawing submittal.

LETTERHEAD

CERTIFICATE OF GUARANTEE FROM METAL ROOF SYSTEM INSTALLER

We, _____ agree to maintain the roofing, flashing,
(Name of Company or Contractor)
and associated items on the below mentioned building for the period indicated. This agreement is to render the roof and the flashing waterproof subject to the conditions outlined below.

OWNER OF BUILDING_____

Location of Building_____

City _____Roof Area _____ square feet.

This Guarantee effective this day of _____ , 20__ , for the term Twenty (20) years from this date, provided any defects result from defective material or workmanship and are not caused by other mechanics, fire, accidents, or by nature over which we have no control.

It is understood and agreed that we will not be responsible for leaks in the roofing or flashing due to excessive winds, distortion of the foundation on which the roofing rests, excessive hail storms, or any other conditions over which we have no control.

Signed _____
Name of Company

By _____

Position _____

Company is a _____
Corp./Partnership/Individual

NOTARY PUBLIC

Registered in the State of: _____

My Commission expires: _____

(Seal)

NOTE: Standard twenty (20) year finish warranty from the manufacturer is to be submitted in addition to the guarantee from the installer found on this form. Manufacturer's Warranty is mandatory - **NO EXCEPTIONS.**

END OF SECTION

13 34 19-11

SECTION 21 01 00

GENERAL FIRE SUPPRESSION PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work covered by Division 21 sections consist of furnishing all labor, equipment, appliances and material for the piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.

B. Some equipment may be furnished by other divisions. Fire Suppression Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the others.

C. General Contractor shall furnish and install all ceiling access panels required to service equipment, valves and controls above gyp board or hidden spline ceilings.

D. General Contractor shall provide all site drive, sidewalk, and other surfaced areas, saw cutting, and repairs back to preexisting conditions for the required mechanical piping. Fire Suppression Contractor shall provide the trenching, bedding and backfill required for the pipe installation.

1.2 RELATED SECTIONS

A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 21. Carefully note its contents in performance of the work.

B. The Architectural, Plumbing, Mechanical, Electrical and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of the Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural details from the mechanical drawings.

C. All electrical power wiring is specified under Division 26 of the Specifications. Fire Suppression Contractor shall furnish all motor starters required for the control and protection of all motors furnished for Division 21, any air compressors, or other fire suppression equipment to be wired by a licensed electrician.

D. All concrete pads and bases required for installing equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.

1.3 CODES, FEES AND LATERAL COSTS

A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:

1. Rogers, Arkansas Fire Prevention Code.
2. Roger, Arkansas AFPLB Rules and Regulations.
3. IBC - International Building Code; latest adopted edition.
4. ASA - American Standards Association.
5. ASME - American Society of Mechanical Engineers.
6. ASTM - American Society of Testing Materials.
7. AWWA - American Water Works Association.
8. NBS - National Bureau of Standards.
9. NEMA - National Electrical Manufacturers Association.
10. NFPA - National Fire Protection Association; the edition referenced by the governing Fire Code or else the latest edition.
11. UL - Underwriters' Laboratories, Inc.
12. OSHA - Occupational Safety and Hazard Association.
13. IFC - International Fire Code; currently adopted edition.

B. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.

C. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.

D. The architectural drawings show the general arrangement of all rooms and finishes. Follow as closely as actual building construction and the work of other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the drawings. General and structural drawings take precedence over mechanical drawings. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, pipes and all other components will fit in the space provided before fabrication or ordering.

E. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.

1.4 GUARANTEE

A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all utilities and their relation to the work before entering into a contract.

B. Identify outdoor underground lines with continuous strip of plastic utility marker tape at regular intervals (maximum of 10 feet) "Caution FIRELINE below". Install one foot directly above pipe before backfilling to grade.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.

B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.

C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.

D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.

E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections. Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.

F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.

G. Support all products by service organizations with adequate spare parts inventory and personnel located within fifty (50) miles of the site.

H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.

B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.

C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all fire sprinkler, general, structural, electrical and mechanical drawings, shop drawings and catalog data to determine how equipment, valves, piping, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.

D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front. Also, provide a CD containing PDFs of the materials and equipment proposed, fire sprinkler drawings, and all RFI correspondence. Use the following folders: Product Manual, FP Drawings, RFIs.

B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.

C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.

D. Shop drawings for the Engineer's files are required on the following items:

1. Booster pumps, starters, controls and instrumentation, etc.

2. Pipe hangers and supports, including any seismic bracing/restraints.

3. Piping materials, including flexible connections, and valves.

4. Complete equipment electrical data and wiring details. Include specifications for pressure switches, flow switches, alarm devices, and air compressors.

5. Sprinkler heads, escutcheons, and guards. Include manufacturer’s data sheets for all sprinklers and finish trim, indicating which sprinkler wrenches apply.

6. Sprinkler plans including calculations and approval from the Authorities Having Jurisdiction.

7. Include all information pertaining to any standpipe and hose systems required, such as hose connections, stations, and cabinets.

8. Include information for all exterior installation, such as joints, restraints, valves, tapping, fire hydrants, bedding, thrust blocking, and preliminary Contractor's Material Test Certificate, to be signed at later date.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Fire Suppression Contractor shall be responsible for any changes required in mechanical, electrical, or structural systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.

B. In order to obtain prior approval on equipment or material not specified in Fire Suppression Specifications or Equipment Schedules, Fire Suppression Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.

C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.

D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

2.5 ELECTRICAL MOTORS

A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.

B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.

C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.

D. Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.

E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

PART 3 EXECUTION

3.1 COORDINATION OF WORK

A. Compare the Fire Suppression drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the fire suppression work. Install the fire suppression work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.

B. It is the responsibility of the General Contractor, Mechanical Contractor, Electrical Contractor and Sprinkler Contractor to coordinate installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.

C. Furnish anchor bolts, sleeves, inserts and supports required for the fire suppression work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.

D. Adjust locations of pipes, equipment, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe prior to fabrication.

1. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.

2. Make offsets, transitions and changes in direction in pipes as required to maintain proper head room and pitch.

E. Install all Fire Suppression work to permit removal without damage to all parts requiring periodic replacement or maintenance. Insure proper clearance for the backflow prevention, fire sprinkler valves, alarm switches, and all such components. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

3.2 RECORD DRAWINGS

A. Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein. Deliver to the Owner/Architect upon completion and acceptance of the work, one (1) complete set of contract drawings marked to indicate all deviations from intended installation.

3.3 CUTTING AND PATCHING

A. The General Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.

B. Cut, patch, repair and/or replace pavements, sidewalks, roads and curbs as required to permit the installation of the work and pay all expenses incurred for this work.

C. Pipes, conduits, cables, wires, pneumatic tubes and similar equipment that pass through fire or smoke barriers shall be protected by the Fire Suppression Contractor in accordance with NFPA 101.

D. All fire stopping assemblies must be UL approved assemblies.

3.4 EXCAVATION AND TRENCHING FOR PIPING

A. Excavate to the depths indicated on the Drawings or as required to provide adequate slope and burial depth. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other method. Sheeting and shoring shall be installed as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

B. Trench Excavation: Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered excavate to a

minimum overdepth of 4" below trench depths indicated on the Drawings or specified. Overdepth in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.

C. Depth of Cover: Trenches shall be of depth that will provide three feet (3') minimum cover or as required by the local utility authorities for fire lines from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

D. Utilities Locating: Locate existing utility lines prior to beginning any excavation

E. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense.

F. Trenches shall not be backfilled until required pressure and other tests have been performed and until the utilities systems as installed conform to requirements of Drawings and Specifications.

G. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones 2-1/2" maximum dimension, deposited in 6" layers and compacted to 95% Standard Proctor Compaction Test of the maximum laboratory density determined in accordance with ASTM D698, Moisture-Density Relation of Soils. If fills fail to meet the specified densities, the Contractor shall remove and re-compact the fill until specified densities are achieved. Compaction test shall be performed for each fifty linear feet of trench.

H. Provide a 4-inch thick (minimum) layer of 3/4-inch No. 4 gravel aggregate bedding beneath all buried piping. Bedding shall be compacted and leveled to provide sloping required.

3.5 EQUIPMENT START-UP AND TESTING

A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.

3.6 CATALOG DATA FOR OWNER

A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the Fire Suppression work and present this

compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:

1. Listing of products alphabetically by name or by a clearly established, organized method approved by the engineer.
2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of the local sales representatives.
3. Certificates of Final Inspections.
4. Complete spare parts data with current prices and supply sources.
5. Extended warranties.
6. As Built Drawings and calculations.
7. Final Release of Lien confirming, or contingent upon, final payment.

B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the fire suppression systems.

C. Provide project record documents indicating all changes from contract documents made during construction.

D. Submit all Certificates of Final Inspections from the Administrative Authorities.

3.7 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the fire suppression system.

3.8 PROTECTIVE COATINGS

A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.

B. Sprinkler Contractor shall clean and prep all exposed sprinkler piping. Painting by others with an acceptable color selected by the Architect.

3.9 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus

materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the fire suppression systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.10 ACCESS PANELS

A. General Contractor shall provide access panels as required in all walls and ceilings to service and have access to all valves and operating parts. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", unless noted otherwise, Milcor type appropriate for the construction involved. Sprinkler Contractor shall coordinate with the General Contractor required access locations. See paragraph 1.1C. this Specification Section for additional information.

3.11 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excluded or noted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

SECTION 21 05 01

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 RELATED REQUIREMENTS

A. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.

B. Section 21 13 01 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME/ANSI B16.1 - 1998 - Cast Iron Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; (R2006).C.ASME/ANSI B16.3 - 1998 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; (R2006).

C. UL 668 - Hose Valves for Fire Protection Service, 2004 rev 2008.

D. ASME/ANSI B16.5 - 1996 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.

E. ASME/ANSI B16.9 - 2001 - Factory-Made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers.

F. ASME/ANSI B16.11 - 2001 - Forged Steel Fittings, Socket-Welding and Threaded; ; The American Society of Mechanical Engineers.

G. ASME/ANSI B16.18 - 1984 (R1994) - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

H. ASME/ANSI B16.21 - 2005 - Nonmetallic Flat Gaskets for Pipe.

I. ASME/ANSI B16.22 - 1995 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

J. ASME/ANSI B16.24 - 1991 (R1998) - Cast Copper Alloy Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.

K. ASME/ANSI B16.25 - 1997 - Buttwelding Ends; The American Society of Mechanical Engineers.

L. ASME/ANSI B16.42 - 1998 - Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300; The American Society of Mechanical Engineers.

M. ASME/ANSI B 36.10 Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers; 1998.

N. ASTM A47/A47M-99(2009) - Standard Specification for Ferritic Malleable Iron Castings.

O. ASTM A53/A53M-07 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

P. ASTM A 135/A 135M - Standard Specification for Electric-Resistance Welded Steel Pipe; 2006.

Q. ASTM A 183 - Standard Specification for Carbon Steel Track Bolts and Nuts.

R. ASTM A 193/A193M - Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.

S. ASTM A 234/A 234M-07 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service R.

T. ASTM A 449 - Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

U. ASTM A 536 - Standard Specification for Ductile Iron Castings.

V. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.

W. ASTM A 795/A 795M - Standard Specification for Black and Hot Dipped Zinc-coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

X. ASTM F 436 - Standard Specification for Hardoned Steel Washers, 2009.

Y. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; 2003.

Z. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

AA. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2002, and Errata 2002 (ANSI/AWWA C151/A21.51).

BB. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; edition adopted by the state.

CC. NFPA 14 - Standard for the Installation of Standpipes and Hose Systems.

DD. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

EE. NFPA 1963 - Standard for Fire Hose Connections, edition adopted by the state.

FF. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

GG. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.

HH. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; 2004.

1.4 SUBMITTALS

A. See Section 21 01 00 - General Fire Suppression Provisions.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Valve Stem Packings: Two for each type and size of valve.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience. approved by manufacturer.

C. Conform to UL, FM, and Warnock Hersey requirements.

D. Valves: Bear UL, FM, and Warnock Hersey label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13, with components being UL listed for 175 psig working pressure, made of materials compatible with piping. Where high pressure systems or regions are called out, such components shall be UL listed for 300 psig working pressure.

B. Welding Materials and Procedures: Conform to ASME Code, meeting requirements set forth by NFPA 13.

2.2 BURIED PIPING

A. Cast Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110, standard thickness.

2. Joints: AWWA C111, rubber gasket.

3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Ductile Fittings: AWWA C110/A21.10 standard thickness.

2. Joints: AWWA C111, rubber gasket with steel nuts and bolts.

3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

4. Encasement shall apply and conform to ASTM A 674 or AWWA C105, PE Film, .008 inches (.20 mm) thick.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 135/A 135M Schedule 10, black for grooved piping.

1. Grooved End Fittings: UL listed, ASTM A 536, ductile iron casting with OD matching steel pipe OD.

2. Cast Iron Fittings: ASME B16.1, threaded fittings.

3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

4. No XL pipe allowed.

5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

B. Steel Pipe: ASTM A 135/A 135M Schedule 30 or 40, black for threaded piping.

1. Steel Fittings: Steel Fittings: ASME B16.5, B16.9, B16.11, B16.25 & A234

2. Cast Iron Fittings: ASME B16.1 & B16.4

3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

4. Pipe Nipples: ASTM A733 made of ASTM A 53 or A 106, Schedule 40, seamless steel pipe.

5. Steel Threaded Couplings: ASTM A 865

6. No XL pipe allowed.

7. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

C. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110/A21.10, standard thickness.

2. Joints: AWWA C111, rubber gasket with steel nuts and bolts

3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.4 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 6 inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 8 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Trapeze Hangers: Should be attached to two (2) steel members.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 GATE VALVES

A. Up to and including 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged ends.

C. Over 4 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.6 GLOBE VALVES (COMPLY WITH UL 262)

A. Up to and including 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity.

B. Over 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.7 BALL VALVES (COMPLY WITH UL 1091)

A. Up to and including 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Bronze two piece body, brass or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.

B. Over 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2.8 BUTTERFLY VALVES (COMPLY WITH UL 1091)

A. Bronze Body:

1. Manufacturers: Nibco, Kennedy or equal.

2. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body

1. Manufacturers: Nibco, Kennedy or equal.

2. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper

switch rated 10 amp at 115 volt AC.

2.9 CHECK VALVES (COMPLY WITH UL 312)

A. Up to and including 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches:

1. Manufacturers: Nibco, Kennedy or equal.

2. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends.

C. 4 inches and Over:

1. Manufacturers: Nibco, Kennedy or equal.

2. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.10 DRAIN VALVES

A. Size and install per NFPA 13. Must be readily accessible with location, elevations, and accessibility subject to approval.

B. Compression Stop:

1. Manufacturers: Nibco, or equal.

2. Bronze with hose thread nipple and cap.

C. Ball Valve:

1. Manufacturers: Nibco, or equal.

2. Brass with cap and chain, 3/4 inch hose thread.

D. Auxiliary Drain Valve:

1. Manufacturers: Nibco, or equal.

2.11 POST INDICATOR VALVES (WALL TYPE OR UPRIGHT)

A. Comply with UL 789, upright post type, ductile iron body, with extension rod, locking device, and ductile iron barrel.

1. Manufacturers: Nibco Model NIP-1AJ, NIP-2AJ, or equal.

2. Bronze with hose thread nipple and cap.

2.12 INDICATING VALVES (COMPLY WITH UL 1091)

A. Integral indicating device, indoor/outdoor rated, ends matching connection piping.

1. Electrical 115 V ac, prewired, single circuit, supervisory switch.

2. All wiring to be performed by a licensed electrician.

2.13 DRY TYPE VALVES (COMPLY WITH UL 260)

A. Tyco DPV-1, or equal, with trim package. Install Quick Opening Device(s), if needed per NFPA 13.

B. Include Air Maintenance Device: UL 260, to correct air pressure in piping and keep such air at designed operating range.

C. Air Compressor: UL 753 shall be rated for 220 VAC, 60 HZ, Single Phase.

D. Include furnishing and installing PS-10, PS-40, flexible hose connectors, mounting kits, and all components required for a complete installation of the dry pipe system.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure, sloping as required by NFPA 13. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Coordinate sprinkler piping installation with work of all other trades. Installation shall maintain harmony of entire mechanical, electrical and plumbing installation.

E. Group piping whenever practical at common elevations.

F. Sleeve pipes passing through partitions, walls, and floors. Fire walls should be fire caulked.

G. Where pipes pass through fire rated walls, use UL listed assembly to maintain the fire rating of wall.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

J. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

2. Place hangers within 12 inches of each horizontal elbow.

3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

K. Slope piping and arrange systems as needed to drain at low points. Use eccentric reducers to maintain top of pipe level.

L. Prepare pipe, fittings, supports, and accessories for finish painting where exposed to view (not concealed above ceilings, in walls, etc.). Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc

rich primer to welding.

M. Do not penetrate building structural members unless indicated.

N. Provide sleeves when penetrating footings and floors. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

P. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

Q. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

R. Provide ball valves for shut-off or isolating service.

S. Provide drain valves at main shut-off valves, low points of piping and apparatus.

T. The Fire Sprinkler Contractor is responsible for calling into question any deficiencies or inconsistencies relating to remote areas, hydraulic calculations/pipe sizing, sprinkler coverages, and system riser/fire pump/standpipe locations PRIOR to submitting a bid.

END OF SECTION

SECTION 21 05 53

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

E. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.3 SUBMITTALS

A. See Section 21 01 00 - General Fire Suppression Provisions, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

1.4 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags.

B. Control Panels: Nameplates.

C. Instrumentation: Tags.

D. Major Control Components: Nameplates.

E. Piping: Tags.

F. Pumps: Nameplates.

G. Relays: Tags.

H. Small-sized Equipment: Tags.

I. Thermostats: Nameplates.

J. Valves: Namplates and ceiling tacks where above lay-in ceilings.

1.5 NAMEPLATES

A. Manufacturers:

1. Kolbi Pipe Marker Co.

2. Seton Identification Products

3. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.

2. Letter Height: 1/2 inch.

3. Background Color: Black.

1.6 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving.

2. Brady Corporation.

3. Kolbi Pipe Marker Co.

4. Seton Identification Products.

5. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

1.7 STENCILS

A. Manufacturers:

1. Brady Corporation.

2. Kolbi Pipe Marker Co.

3. Seton Identification Products.

4. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.

B. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.

5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.

6. Equipment: 2-1/2 inch high letters.

C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

D. Manufacturers:

1. Brady Corporation.

2. Kolbi Pipe Marker Co.

3. MIFAB, Inc.

4. Seton Identification Products.

5. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.

E. Color: Conform to ASME A13.1.

F. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

G. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

H. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

1.8 CEILING TACKS

A. Manufacturers:

1. Craftmark.

2. Substitutions: See Section 21 01 00 General Fire Suppression Provisions for requirements.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. Standard colors.

PART 3 EXECUTION

2.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

2.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install metallic detection tape located approximately 12 inches above pipe, where in ground utility lines are buried outside building footprint. Tape shall be continuous and be marked, indicating utility type (ie. water, sewer, gas, electric, etc).

F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

SECTION 21 13 01

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system, submittals and quality control.

B. System design, installation, and certification.

C. Fire department connections, Life Safety System coordination and field quality control.

1.2 RELATED REQUIREMENTS

A. Section 28 31 04 - Fire Detection and Voice Evacuation System

B. Section 21 05 01 - Common Work Results for Fire Suppression: Pipe, fittings, and valves.

C. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

D. Division 26 Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

C. IFC - International Fire Code, latest accepted edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 21 01 00 - General Fire Suppression Provisions, for submittal requirements.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

3. Submit shop drawings, product data, and hydraulic calculations to Fire Marshall for approval. Submit proof of approval to Engineer.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

2. Sprinkler Wrenches: For each sprinkler type.

1.6 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to all code requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.

E. Equipment and Components: Provide products that bear UL label or marking.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation. Keep all materials clean and free of debris and material damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tyco Fire Products.

B. Grinnell.

C. Star Manufacturing Company.

D. Reliable Automatic Sprinkler.

E. Substitutions: Approved equal.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Contractor shall extend existing fire protection system as required to provide coverage for new building addition. Contractor shall field verify existing conditions to determine extent of the work, including required piping connection points and coverage calculations per NFPA 13, prior to bid and construction.

B. Sprinkler System: Contractor shall rework existing fire protection system as required to provide coverage for remodeled areas within project scope. Contractor shall field verify existing conditions to determine extent of the work, including required piping connection points and coverage calculations per NFPA 13, prior to bid and construction.

C. Refer to civil and mechanical plans, Sprinkler Contractor shall provide connections for future building expansions where indicated.

D. Provide anti-freeze loop where required for coverage where wet system areas are exposed to freezing conditions. Include RPZ and expansion chamber as needed. Coordinate floor drain/sink locations and sizes needed for proper draining.

E. Remote Area may be decreased where quick response sprinklers are at level, flat ceilings of light or ordinary hazard wet systems - when such is the case, this SHALL BE THE FIRST modification made and shall be in accordance with this formula:

1. 675 + 22.5*H (where H is the peak ceiling height, up to 20 ft - minimum remote area is 900 sf).

F. Design Areas (Remote Areas) shall be increased 30% where dry systems are utilized.

G. Where sprinklers are under slopes exceeding 2:12, the remote area (obtained by figures, tables, or the above formula) must be increased 30%.

H. Occupancy per NFPA 13, Appendix A and elsewhere, and as clarified, amended and outlined below:

1. Automobile Parking Areas: Ordinary Hazard, Group 1.
2. Building Service Areas: Ordinary Hazard, Group 1.
3. Churches: Light Hazard.
4. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
5. Dry-Cleaners: Ordinary Hazard, Group 2.
6. General Storage Areas: Ordinary Hazard, Group 1.
7. Laundries: Ordinary Hazard, Group 1.
8. Libraries, Except Stack Areas: Light Hazard.
9. Library Stack Areas: Ordinary Hazard, Group 2.
10. Machine Shops: Ordinary Hazard, Group 2.
11. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
12. Office and Public Areas: Light Hazard.
13. Plastics Processing Areas: Extra Hazard, Group 2.
14. Printing Plants: Extra Hazard, Group 1.
15. Repair Garages: Ordinary Hazard, Group 2.
16. Residential Living Areas: Light Hazard.
17. Restaurant Service Areas: Ordinary Hazard, Group 1.
18. Solvent Cleaning Areas: Extra Hazard, Group 2.
19. Upholstering Plants: Extra Hazard, Group 1.
20. Laboratories, including Classroom Laboratories: Ordinary Hazard, Group 1 or 2 as determined by criteria set forth in NFPA 13.

I. Minimum Density for Automatic-Sprinkler Piping Design:

1. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft.

2. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.

3. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft.

4. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft.

5. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft.

J. Maximum Protection Area per Sprinkler: Per UL listing.

1. Office Spaces: 225 sq. ft. (20.9 sq. m).

2. Storage Areas: 130 sq. ft. (12.1 sq. m).

3. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).

4. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).

5. Other Areas: NFPA 13, unless otherwise indicated.

K. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:

1. Light-Hazard Occupancies: 100 gpm (6.3 L/s) for 30 minutes.

2. Ordinary-Hazard Occupancies: 250 gpm (15.75 L/s) for 60 to 90 minutes.

3. Extra-Hazard Occupancies: 500 gpm (31.5 L/s) for 90 to 120 minutes.

L. Water Supply: Obtain static pressure and volumetric flow at residual pressure from a water flow test data conducted per NFPA 291.

M. Margin of Safety for Available Water Flow and Pressure:

1. Contact the Water Department to request a hydraulic model pressure based on maximum usage in peak season and maintain 20% safety margin unless flow test was conducted in peak season in the last 6 months, in which case 10% safety margin is acceptable. If a Fire Pump is required to meet the requirements of this section, fire sprinkler contractor shall submit a request for waiver of this requirement to the contractor.

N. If pressure booster pump will be required for achieving required pressure in fire sprinkler system, sprinkler designer shall size pump to provide required flow and pressure unless such information is provided in Section 21 30 00.

O. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve. Include water flow switch tamper resistant hex key (allen wrench), paperwork related to all riser switches, sprinkler wrenches for each type of sprinkler provided on the job, and spare sprinklers of number and ratio provided by NFPA 13.

P. Standpipes: Provide wet type, manual, interconnected standpipes per the pipe schedule method or calculated and sized, in accordance with NFPA 14. Where Standpipes cover stage areas, Fire pump sizing shall be based upon NFPA 13 for the fire sprinkler demand and hose connections shall be provided on each side of the stage designed per the latest accepted edition of the Arkansas Fire Protection Code.

Q. Provide standpipes and hose connections in all stairwells. In addition, provide hose connections at any point exceeding 100 feet of travel distance plus 30 feet of hose spray from egress or adjacent hose connections where locations of such hose connections are required by the fire department. Refer to fire protection drawings, details, and notations for standpipe and hose connection requirements and locations.

R. Manual Wet-type, Class 1 Standpipe Systems: System includes NPS 2-1/2-inch hose connections with small water supply to maintain water in the standpipes. Piping is wet, however, water must be pumped into standpipes to satisfy demand.

S. 175 PSIG Hose Connection: Comply with UL668, FM and UL approved bronze [no copper alloy (brass) allowed containing more than 15 percent zinc], 175 psig minimum pressure rating. Include angle pattern design; female NPS inlet and male hose outlet, and lugged cap, gasket and chain. Include NPS 1-1/2" or NPS 2-1/2" as required and hose valve threads according to NFPA 1963 and matching local fire department threads. Provide NPS 2-1/2" x 1-1/2" adapters where 1-1/2" male hose threads are furnished throughout the project, so the fire department connects to 2-1/2" NPS male thread.

T. Reference FP drawings for other information pertaining to the design of this project.

2.3 SPRINKLERS (PER UL 199) SPECIFIED FIRE SPRINKLERS ARE SUBJECT TO TYPES AND LOCATIONS AS INDICATED BELOW.

A. Suspended Ceiling Type: Concealed pendant type with listed concealed plate.

1. Finish: Enamel, color as selected.

2. Escutcheon Plate Finish: Enamel, color as selected.

3. Glass Bulb Ordinary Temperature Rating with listed Concealed Plate.

4. Fusible Link: Temperature rated for application.

B. Suspended Ceiling Type: Semi-recessed pendant type with matching screw on escutcheon plate.

1. Finish: Enamel, color as selected.

2. Escutcheon Plate Finish: Enamel, color as selected.

3. Glass Bulb: 155 degrees.

4. Fusible Link: Temperature rated for application.

C. Exposed Area Type: Standard upright type with guard.

1. Finish: Brass plated or color to match painted area.

2. Glass Bulb: 200 degrees.

3. Fusible Link: Temperature rated for application.

D. Sidewall Type: Semi-recessed horizontal sidewall type with matching screw on escutcheon plate.

1. Finish: Enamel, color as selected.

2. Escutcheon Plate Finish: Enamel, color as selected.

3. Fusible Link: Temperature rated for application.

E. Sprinkler Guards: Finish to match sprinkler finish and to be listed with the fire sprinkler being protected. Wire cage type, including fastening device for attaching to sprinkler such guard is listed with. Provide Sprinkler Guards where sprinklers are less than 7'9 from finished floor and anywhere sprinklers are subject to being damaged (such as when located near shelving or racks, in or in proximity to gymnasiums, over conveyors, in trash chutes, etc…).

F. Special Coatings: Use special coatings where required; however, do not utilize quick response sprinklers where special coatings are needed. In such cases, manufacturer's corrosion resistant paint will be sufficient.

2.4 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim, with test and drain valve.

B. Water Motor Alarm per UL 753: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings, and inlet strainer.

C. Electric Alarm per UL 464: Electrically operated red enameled 8” gong with pressure alarm switch, 24 VDC or as required by the Authority Having Jurisdiction.

D. Water Flow Switch per UL 346: Vane type switch for mounting horizontal or vertical, with two contacts; rated to match fire alarm panel by others.

E. Fire Department Connections per UL 405:

1. Outlets: of type and model subject to the "first responder" fire department, with hardware; threaded dust cap and chain of matching material and finish as subject to same wall mounted or free standing, as required by the fire department with signage designating what is supplied (Auto Sprinkler System, Standpipes, Dry Standpipes Only, etc.). Lockable caps and signage required by Fire Code shall be provided.

2. Drain: 3/4 inch automatic drip, outside.

3. Drain: 3/4 inch automatic drip, in gravel base at foot of 90 degree elbow below fire department connection.

4. Label: "Sprinkler - Fire Department Connection".

5. Refer to drawings for proposed location of fire department's connection. Gain approval of fire department officials for location of fire department connection prior to commencing installation. Department connection must be within 100 ft of a fire hydrant by state code and may be required to be located even closer in some jurisdictions.

F. Supervisory Switches per UL 753: As manufactured by Potter Model OSYSV-2 or approved equal.

G. Room Temperature Supervisory Switches: As manufactured by approved supplier.

H. Water Flow Switches per UL 346: As manufactured by Potter Model VSR-F2 or approved equal.

I. 24 VDC Electric 8" alarm bell mounted at 9 ft elevation on exterior wall near riser unless other such means of notification are required by the local fire authority, whether mechanical, horn/strobe, or otherwise..

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator for each Lead In.

D. Provide approved backflow preventer assembly at sprinkler system water source connection. Reduced pressure backflow preventer equipment and installation shall conform to the requirements of the city of Rogers, the State in which the Project is located Backflow Prevention and Cross Connection Control Program.

E. Locate remote fire department connection, as indicated on plans, with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

F. Locate outside alarm notification device (bell, horn,strobe, or gong) on building wall.

G. Place pipe runs to minimize obstruction to other work. Coordinate with electrical and other mechanical trades. Refer to site utility plans.

H. Place piping in concealed spaces above finished ceilings. In areas where there is a combination of exposed areas and finished ceiling spaces, piping shall be routed above the finished ceiling spaces. All piping shall be concealed wherever possible throughout entire project.

I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required or locate concealed type sprinklers centered in tiles in one direction and not less than 6" off ceiling grids in any direction.

J. Apply masking tape, or paper cover, or plastic caps to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

K. Install and connect to fire pump system per NFPA 13 as required.

L. Flush entire piping system of foreign matter per NFPA standard.

M. Install guards on sprinklers as required to prevent damage or injury.

N. Hydrostatically test entire system. Furnish completed test results signed by all required authorities and furnish a Contractor’s Material Test Certificate per State Rules and Regulations and NFPA 13.

O. Test to be witnessed by the Authority Having Jurisdiction and/or fire official unless the Authority Having Jurisdiction waives the right to witness and thus defaults the responsibility solely to the Owner's representative. In such a case, the waiver shall be included in the closeout documents. In all cases, the signed test certificate shall be provided in the closeout documents.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

B. All fire sprinkler system components required to interface with the fire alarm system to be supplied and installed by the Fire Sprinkler Contractor. The Fire Alarm Contractor shall coordinate these components with the Fire Sprinkler Contractor and provide necessary equipment and wiring for connection of these components to the fire alarm system.

3.3 LABELING AND IDENTIFICATION

A. Install in accordance with Section 21 05 53.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Testing: All systems to be hydrostatically tested for the greater of 200 psi OR 50 psi above the maximum anticipated normal system pressure at 2 hours per NFPA 13. Dry systems to be air tested per NFPA 13.

2. Electronic/Alarm Equipment Testing: All alarm devices, fire pump controls, air compressors, and all such electrical equipment and devices interfaced with the fire sprinkler system to be tested and attested to in Contractor's Material Test Certificate, noting such tests were coordinated and verified.

3. Fire Pump Testing: Where Diesel fire pumps are required, diesel fuel shall be supplied for testing and for continual operation after testing, and fire pump tests shall be conducted per NFPA 20 and reports shall be included in the Product Manual.

4. Training and Educating: This Contractor shall train and educate the Owner, or his designated representative, by supplying NFPA 25, with highlighted sections corresponding to his responsibilities and information he should need to know, AND instructions shall be given for emergency procedures and general maintenance of the system, and test sheets shall be given for any periodic tests the Owner is responsible for, beyond the supplier's annual testing.

5. Annual Inspection: Include a 1 year annual inspection to be conducted 1 year after this work is completed and the warranty has expired. Any Work revealed by such inspection that should have been included in the initial installation shall be so referenced in the inspection documents and completed as warranty work within 30 days of the inspection.

END OF SECTION

SECTION 22 01 00

GENERAL PLUMBING PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work covered by Division 22 sections consist of furnishing all labor, equipment, appliances and material for the heating, air conditioning, piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.

B. General Contractor shall install all concrete pads and bases required for installing mechanical equipment. Mechanical Contractor is responsible for the exact sizes required, location of anchor bolts, etc.

C. Some equipment may be furnished by other divisions. Mechanical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by others. Furnish the supplies (hot and cold water cut-offs), traps, drains, controls, gas piping, pressure reducing valves, etc., on all equipment furnished by other divisions.

D. General Contractor shall furnish and install all ceiling access panels required to service mechanical equipment, valves and controls above gyp board or hidden spline ceilings.

E. General Contractor shall provide all site drive, sidewalk and other surfaced areas saw cutting and repairs back to preexisting conditions for the required mechanical piping. Mechanical Contractor shall provide the trenching, bedding and backfill required for the pipe installation.

1.2 RELATED SECTIONS

A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 22. Carefully note its contents in performance of the work.

B. The Architectural, Mechanical, Electrical, and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of this Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural

details from the mechanical drawings.

C. All electrical power wiring is specified under Division 26 of the Specifications. Mechanical Contractor shall furnish all motor starters required for the control and protection of all motors furnished for the Division 22.

D. All concrete pads and bases required for installing mechanical equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.

E. Paint all mechanical equipment piping, supports and other exposed material. Do not paint equipment supplied with painted finish, such as the main mechanical equipment unless damaged during handling and installation. In such cases, use touch-up paint of the same type and color as original paint. Conform to requirements in other sections of the Specifications and match wall finish to the room in which installed.

1.3 CODES, FEES AND LATERAL COSTS

A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:

1. Bentonville, Arkansas City Building Code.
2. Arkansas State Mechanical Code.
3. Arkansas State Plumbing Code.
4. Arkansas Energy Code.
5. IBC - International Building Code.
6. IFC - International Fire Code; latest accepted edition.
7. IGC - International Gas Code; latest accepted edition.
8. IPC - International Plumbing Code; latest accepted edition.
9. IMC - International Mechanical Code; latest accepted edition.
10. IECC - International Energy Conservation Code; latest accepted edition.
11. AMCA - Air Moving & Conditioning Association.
12. ASA - American Standards Association.
13. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.

14. ASME - American Society of Mechanical Engineers.
15. ASTM - American Society of Testing Materials.
16. AWWA - American Water Works Association.
17. NBS - National Bureau of Standards.
18. NEMA - National Electrical Manufacturers Association.
19. NFPA - National Fire Protection Association.
20. SMACNA - Sheet Metal & Air Conditioning Contractors' National Association.
21. UL - Underwriters' Laboratories, Inc.
22. AGA - American Gas Association.
23. OSHA - Occupational Safety and Hazard Association.
24. AABC - Associated Air Balance Councils.
25. NEBB - National Environmental Balancing Bureau.

B. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

C. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.

D. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.

E. The mechanical drawings show the general arrangement of all piping, equipment and appurtenances. Follow as closely as actual building construction and the work of other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the drawings. General and structural drawings take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, ducts, pipes and all other

components will fit in the space provided before fabrication or ordering.

F. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.

G. Mechanical Contractor shall provide and install, where applicable, seismic restraints for all piping and duct systems per the latest accepted Building Code.

1.4 GUARANTEE

A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all utilities and their relation to the work before entering into a contract.

B. Identify outdoor underground lines with continuous strip of plastic utility marker tape at regular intervals (maximum of 10 feet) "Caution (state utility) pipe below". Install one foot directly above pipe before backfilling to grade.

1.8 EXISTING BUILDING AND EXISTING MECHANICAL EQUIPMENT

A. Visit the existing building and become thoroughly acquainted with the existing mechanical systems and utilities in order to determine all of the work that will be necessary to carry out the intent of the plans and specifications.

B. If it is necessary, in any way, to interfere with normal operations of the existing utilities in order to carry out the work, give notice and obtain written approval from the Owner before the work is started.

C. The work involved in this project requires the Contractor to work inside of an existing building. Interruption of the regular routine of the building by the Contractor must be kept to a minimum.

1.9 EQUIPMENT NOT SPECIFIED UNDER DIVISION 22

A. Equipment which requires plumbing and other mechanical connections may be specified in another division of this Specification. Under these conditions, provide necessary utilities including waste, water and natural gas.

B. Rough-in work from approved shop drawings only.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.

B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.

C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.

D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.

E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections. Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.

F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of

any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.

G. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.

H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.

B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.

C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all general, structural, electrical and mechanical drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.

D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation, or electronic submittals as detailed below. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front.

1. If Electronic files are submitted, a complete set of the schedule of materials and equipment proposed for the installation shall be included. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data. All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files according to the corresponding specification section (i.e. "22 10 06 - Plumbing Specialties.pdf"). Unless incomplete submittals are authorized by the project engineer, all Division 22 submittals shall be

electronically sent at one time. Without authorization, incomplete submittals shall be rejected.

B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.

C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.

D. Shop drawings for the Engineer's files are required on the following items:

1. Plumbing fixtures, floor drains, and roof drains.
2. Valves/flex connectors and other specialties.
3. Water balance certification.
4. Piping materials including valves.
5. Piping insulation materials.
6. Complete mechanical equipment electrical data and wiring details.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Mechanical Contractor shall be responsible for any changes required in mechanical, electrical, structural or vibration isolation systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.

B. In order to obtain prior approval on equipment or material not specified in Division 22 Specifications or Equipment Schedules, Mechanical Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.

C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.

D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

2.5 ELECTRICAL MOTORS

A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.

B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.

C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.

D. Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.

E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

PART 3 EXECUTION

3.1 COORDINATION OF WORK

A. Compare the mechanical drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the mechanical work. Install the mechanical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.

B. It is the responsibility of the General Contractor, Mechanical Contractor and Electrical Contractor to coordinate installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.

C. Furnish anchor bolts, sleeves, inserts and supports required for the mechanical work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.

D. Adjust locations of pipes, ducts, equipment fixtures, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

1. New work and remodeled areas are to interface with existing facility services. Contractor to familiarize himself with the extent of the work prior to submitting his bid. Failure to gain familiarity will not be grounds for additional compensation.

2. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.

3. Make offsets, transitions and changes in direction in pipes and ducts as required to maintain proper head room and pitch.

E. Install all mechanical work to permit removal without damage to other parts, to coils, fan shafts and wheels, filters, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

3.2 CHLORINATION OF DOMESTIC WATER LINES

A. After the hot and cold water systems are complete, all fixtures connected, the system flushed out completely and the shut-off valve to the water main closed, fill the system with a solution containing 50 parts per million of available chlorine. Allow the solution to stand six (6) hours before flushing and returning to service.

B. Then fill the system with a solution containing 100 parts per million of available chlorine. Allow this solution to stand two (2) hours before flushing and returning to service.

C. Notify the Owner twenty-four hours prior to test so his representative can witness test. Obtain chemical analysis of the domestic water lines after chlorination from a Certified Chemist and submit the results of these tests to the Engineer and Owner.

3.3 RECORD DRAWINGS

A. Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein. Deliver to the Owner/Architect upon completion and acceptance of the work, one (1)

complete set of contract drawings marked to indicate all deviations from intended installation.

3.4 CUTTING AND PATCHING

A. The General Contractor shall be responsible for all required Building cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.

B. The General Contractor shall cut, patch, repair and/or replace pavements, sidewalks, roads and curbs as required to permit the installation of the plumbing work and pay all expenses incurred for this work.

3.5 EXCAVATION AND TRENCHING FOR PIPING

A. Excavate to the depths indicated on the Drawings or as required to provide adequate slope and burial depth. Excavated materials not required or suitable for backfill or fill shall be removed from the site. Do such grading as is necessary to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other method. Sheeting and shoring shall be installed as may be necessary for protection of the work and for safety of personnel. Excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

B. Trench Excavation: Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil. Where rock is encountered excavate to a minimum overdepth of 4" below trench depths indicated on the Drawings or specified. Overdepth in rock excavation and unauthorized overdepths shall be backfilled. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe is encountered such soil shall be removed and the trench backfilled to proper grade as hereinafter specified.

C. Depth of Cover: Trenches shall be of depth that will provide three feet (3') minimum cover for domestic water, fire lines, sanitary and storm sewers from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

D. Utilities Locating: Locate existing utility lines prior to beginning any excavation

E. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor, at his expense.

F. Trenches shall not be backfilled until required pressure and other tests have been performed and until the utilities systems as installed conform to requirements of Drawings and Specifications.

G. Backfill trenches with excavated materials consisting of earth, sandy clay, sand, gravel, soft shale or other approved materials, free from clods of earth or stones 2-1/2" maximum dimension, deposited in 6" layers and compacted to 95% Standard Proctor Compaction Test of the maximum laboratory density determined in accordance with ASTM D698, Moisture-Density Relation of Soils. If fills fail to meet the specified densities, the Contractor shall remove and re-compact the fill until specified densities are achieved. Compaction test shall be performed for each fifty linear feet of trench.

H. Provide a 4-inch thick (minimum) layer of 3/4-inch No. 4 gravel aggregate bedding beneath all buried piping. Bedding shall be compacted and leveled to provide sloping required.

I. Tests for displacement of sewers: After the trench has been backfilled to 2 feet or more above the pipe, if the pipe shows poor alignment, displaced pipe, or any other defects, such defects shall be remedied by the Contractor at his expense.

3.6 EQUIPMENT START-UP AND TESTING

A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.

3.7 CATALOG DATA FOR OWNER

A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the mechanical work and present this compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:

1. Listing of products alphabetically by name.

2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of the local sales representatives.

3. Certificates of Final Inspections.

4. Complete spare parts data with current prices and supply sources.

5. Extended warranties.

B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the mechanical and plumbing systems.

C. Provide project record documents indicating all changes from contract documents made during construction.

D. Submit all Certificates of Final Inspections from the Administrative Authorities.

E. Submit TAB reports on approved forms. Final TAB report submittals shall include all required rebalances if any are required.

F. Submit to the Engineer as soon as practical, electronic closeout documents as detailed below.

1. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front.All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files.

3.8 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the mechanical system.

3.9 PROTECTIVE COATINGS

A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.

3.10 TEST AND ACCEPTANCE

A. Water Piping System: Test with water at 100 psi for one (1) hour or with available city water pressure for twenty-four (24) hours to prove tight and free from leaks.

B. Plumbing and Drainage System: Test the new system humidity and drain piping with water and prove tight. Test system with 10 feet of water for 24 hour period. Air test is not permitted.

C. Storm Drainage System: Test storm drainage system with 10 feet of water for a 24-hour period. If approved by the administrative authority and there is proof that no site water is available, an air test of 5 pounds for 24 hours without introduction of additional air may be used. The air test shall be conducted with a three-inch gage with a maximum scale of 100 psig. This test applies to new storm drains connecting to existing storm drain system. Any failures to the existing storm drain system shall be

brought to the attention of the administrative authority prior to the completion of the installation.

3.11 NOISE CONTROL

A. It is intended that the mechanical systems as installed under this contract be free from objectionable noise when the system is operating. The system shall operate at noise levels below criteria recommended for the application by ASHRAE. Provide vibration isolation accessories and isolate equipment, pipeline, ductwork, etc., as required so as to insure an acceptable noise level in all of the mechanical systems.

3.12 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the mechanical systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.13 SYSTEM OPERATING TESTS

A. After the successful completion of all equipment start-up and test requirements, perform the following tests on the complete mechanical systems:

1. First Operating Test by Contractor: Prove the operation of the mechanical systems and of each individual item in the systems. Give at least 10 days prior notice to the Engineer of such tests. Adjust and set proper quantities to all items and equipment. Should any item of the systems fail to perform in an approved manner, repeat this test until approved by the Engineer. During this test, balance circulation of heating and cooling water to balancing cocks, valves, thermostats and similar Items to insure that the mechanical systems perform as intended.

2. Checking by Owner and Engineer: Following the successful completion of first operating tests by the Contractor, the Owner and the Engineer have the privilege of making such tests as they may desire during a period of three weeks to ascertain in detail if any corrections are to be made to the system. At the end of the testing by the Owner and the Engineer, the Engineer may direct the Contractor in writing to make such corrections to the systems as are within the scope of the contract.

3. Contractor's Corrections to Systems: Make all required corrections to the systems and notify the Engineer in wiring that the corrections outlined have been

completed. Give at least seven (7) days notice of a final three-day operating test.

4. Three-Day Operating Test: Perform an operating test to the satisfaction of the Engineer for a period of three (3) days. Should any element of the systems not perform properly, make all required corrections and repeat the test until successfully performed.

    a. Submit the Form of Record proposed by the Contractor for the recording of all measurements to the Engineer for approval at least two weeks before the approved form will be required by the Contractor.

    b. Measurements: Make the following measurements at two-hour intervals (5 measurements per 8-hour day) during the three-day operating test.

        1) Electrical: Running amperes and voltage of each motor 3/4 horsepower or larger.

        2) Air temperatures in each heated or air conditioned space and outdoor temperatures.

    c. Instruments: Provide all instruments, materials and labor to perform the tests and to obtain and record the measurements specified herein, including the furnishing of all required record forms as approved by the Engineer. Submit for the Engineer's approval, complete shop drawings or catalog data for all instruments to be used for the three day operating test and obtain approval at least two weeks before the instruments will be required for test measurements.

    d. Report: Submit four (4) copies of a written report of the three-day operating test on the approved Form of Record to the Engineer for approval and subsequent transmittal to the Owner.

3.14 MOTOR CONTROL

A. General: Provide each motor 1/8 horsepower or larger with a suitable controller and devices that will perform the functions as specified for the respective motors, together with manual reset thermal overload, protection in each undergrounded conductor. Provide the controller either integral with circuit protective device or mounted in separate enclosure. Starters shall be Allen-Bradley, G.E., Westinghouse, Square D or approved equal.

B. Control: Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motor directly, provided the device used is designated for that purpose and has an adequate horsepower rating. When automatic control device does not have such a rating, use a magnetic starter with the automatic

control device actuating the pilot control circuit. When combination manual and automatic control is specified and the control device operates the motor directly, provide a manual motor starter and selector switch. When combination manual and automatic control is specified and the automatic control device actuates the pilot control circuit, a magnetic control device actuates the pilot control provided. Provide all magnetic starters with push buttons or selector switches in the covers. Provide connections to the selector switch such that only the normal automatic regulating control devices will be bypassed when the switch is in the manual position. Connect all safety control devices, such as low or high pressure cutouts, high temperature cutouts and motor overload protective devices in the motor control circuit in both the manual and automatic positions of the selector switch control circuit. Make connections to any selector switch or to more than one (1) automatic regulatory control device in accordance with wiring diagrams recommended by the manufacturer and approved by the Engineer. Where required for manual control, provide push-button stations consisting of two (2) momentary contact operators, 600 volts, 10 amperes installed and wired for three wire control to provide under-voltage relays, auxiliary contacts or other devices required for a complete system.

C. Location: Where the controller is located within sight of the motor driven equipment (fifty feet or less), the controller and circuit protective device shall be capable of being locked in the open position. Where the controller is located out of sight of the motor driven equipment (more than fifty feet) provide a non-fused safety disconnect, suitable for the service, and which opens all ungrounded conductors simultaneously, at or on the motor driven equipment.

D. Enclosure: Enclosure to be general purpose, NEMA Type 1 unless noted otherwise (NEMA Type 1 gasketed). The circuit breaker shall be operable by hand from outside the enclosure and shall be so interlocked with the door or doors that it must be returned to the "OFF" position before the door can be opened.

E. Push-buttons: Provide maintained contact, standard duty type in a general purpose, NEMA Type 1 enclosure for surface mounting rated for 10 amperes continuous at 600 volts or less.

3.15 ACCESS PANELS

A. Provide access panels as required in all walls, ceilings and ductwork to service and have access to all valves, and other operating parts. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", unless due to structural restraints the access door can be reduced to a minimum of 18" x18", Milcor type appropriate for the construction involved.

3.16 DEMOLITION

A. There are areas in the existing building in which demolition will have to be performed due to the requirements for remodeling. The demolition work involved is not fully described herein; however, the information given on the electrical and mechanical drawings and the information set out in the specifications will substantially serve to inform the mechanical Contractor as to the full extent of the demolition required.

B. Contractor should visit job site to verify extent of demolition required to complete project.

C. It is the intent of this Specification that all required demolition work be fully and completely performed and all work be accomplished in a neat and workmanlike manner.

D. Remove all existing piping, fittings, heating, cooling, ventilation equipment that is required to accomplish the remodel work. All existing utilities that are disconnected shall be capped recessed in walls and floors. Contractor shall be responsible for visiting building and determining the extent of the demolition work. Contractor shall provide any necessary temporary piping required to keep existing building utilities (water, gas and sewer) in operation until new construction is completed to the extent that the new utilities can be reconnected.

E. All rubbish, debris and expendable items resulting from demolition work shall be removed from the premises as it accumulates and disposed of at an off-site location by the Contractor.

3.17 SALVAGE

A. Except as otherwise specified herein, or noted on drawings, the Contractor shall receive title to all building materials indicated to be demolished or removed which are not specifically designated as being retained by the Owner, said title to vest in the Contractor immediately upon receipt of Work Order. All salvage materials removed shall be taken from the premises promptly, as the storage of salvage materials on the site will not be permitted. Bidders shall take into account the salvage value to them of materials removed and such value shall be reflected in the bids.

B. All items of usable equipment shall remain the property of the Owner. All such items of equipment which are to be removed and which are not to be reused shall be stored on the premises by the Contractor as directed by the Owner.

C. Usable items shall be determined by the Owner and shall include existing heating and cooling pumps and other equipment so designated as "usable" by the Owner.

3.18 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

D. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

C. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.3 SUBMITTALS

A. See Section 22 01 00 - General Plumbing Provisions for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number. Valve locations with tag numbers shall also be indicated on "as-built" drawings.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

2.2 IDENTIFICATION APPLICATIONS

A. Instrumentation: Tags.

B. Piping: Pipe markers.

C. Small-sized Equipment: Tags.

D. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.3 NAMEPLATES

A. Manufacturers:

1. Kolbi Pipe Marker Co.

2. Seton Identification Products.

3. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.

2. Letter Height: 1/4 inch.

3. Background Color: Black.

4. Plastic: Conform to ASTM D709.

2.4 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving.

2. Brady Corporation.

3. Kolbi Pipe Marker Co.

4. Seton Identification Products.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame. Valve tag chart should should indicate valve size, valve model and valve location. Valve locations with tag numbers shall also be indicated on "as-built" drawings.

2.5 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation.
2. Kolbi Pipe Marker Co.
3. MIFAB, Inc.
4. Seton Identification Products.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
2. Fire Quenching Fluids: Red with white letters.
3. Combustible Fluids: Brown with white letters.

2.6 CEILING TACKS

A. Manufacturers:

1. Craftmark.
2. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. Plumbing Equipment: Yellow.

2. Plumbing Valves: Green.

3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Apply ASME A13.1 Pipe Marking Rules:

1. Place pipe marker adjacent to changes in direction.

2. Place pipe marker adjacent each valve port and flange end.

3. Place pipe marker at both sides of floor and wall penetrations.

4. Place pipe marker every 25 to 50 feet interval of straight run.

F. Install metallic detection tape located approximately 12 inches above pipe, where in ground utility lines are buried outside building footprint. Tape shall be continuous and be marked, indicating utility type (ie. water, sewer, gas, electric, etc).

G. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service, flow direction, and pressure.

2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Locate ceiling tacks to locate valves above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 22 07 19

PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Piping insulation.

C. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

G. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

H. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

L. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

1.4 SUBMITTALS

A. See Section 22 01 00 - General Plumbing Provisions, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than five years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

C. Perform work at ambient and equipment temperature as recommended by the adhesive manufacturer.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER

A. Manufacturers:

1. Knauf Insulation.
2. Johns Manville Corporation.
3. Owens Corning Corp.
4. CertainTeed Corporation.
5. Armstrong World Industries, Inc.
6. Rubatex Corp.
7. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.

1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 650 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.

F. Insulating Cement/Mastic:

1. ASTM C195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Blanket: 1.0 lb/cu ft density.

3. Weave: 5x5.

H. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, white color.

I. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement:

1. ASTM C449/C449M.

2.3 CELLULAR GLASS

A. Manufacturers:

1. Pittsburgh Corning Corporation.

2. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Insulation: ASTM C 552.

1. 'K' value: 0.37 at 100 degrees F.

2. Service Temperature: Up to 900 degrees F.

3. Water Vapor Permeability: 0.005 perm inch.

4. Water Absorption: 0.2 percent by volume, maximum.

2.4 HYDROUS CALCIUM SILICATE

A. Manufacturers:

1. Johns Manville Corporation.

2. PABCO.

3. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Insulation: ASTM C533 and ASTM C795; rigid molded, asbestos free, gold color.

1. 'K' value: 2 and C518; 0.40 at 300 degrees F, when tested in accordance with 2 or 1.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Insulating Cement:

1. ASTM C449/C449M.

2.5 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Armacell International.

2. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 2; use molded tubular material wherever possible.

1. 'K' value: ASTM C 177; 0.27 at 75 degrees F.

2. Maximum Moisture Absorption - Pipe Insulation: 3.5 percent, by weight, when tested in accordance with ASTM D 1056.

3. Maximum Moisture Absorption - Sheets: 6.0 percent, by weight, when tested in accordance with ASTM D 1056.

4. Water Vapor Permeability: 0.20 perm-inches, when tested in accordance with ASTM E 96.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

1. Air dried, contact adhesive, compatible with insulation.

2.6 JACKETS

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation.

b. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 15 mil.

e. Connections: Pressure sensitive color matching vinyl tape.

3. Covering Adhesive Mastic:

a. Compatible with insulation.

B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

1. Lagging Adhesive:

a. Compatible with insulation.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

1. Thickness: 0.016 inch sheet.

2. Finish: Embossed.

3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Repair all insulation that is damaged during construction using the same materials.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Inserts and Shields:

1. Application: Piping 1 inch diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams

located on bottom side of horizontal piping.

L. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Supply:

a. Glass Fiber Insulation:

1) Pipe Size Range: 2 inch and under: 1 inch thickness.

2) Pipe Size Range: 2-1/2 inch and larger: 1-1/2 inch thickness.

3) Thickness: 1/2 inch (in interior walls).

2. Domestic Cold Water Supply:

a. Glass Fiber Insulation:

1) Pipe Size Range: 2 inch and under: 1 inch thickness.

2) Pipe Size Range: 2-1/2 inch and larger: 1 inch thickness.

3) Thickness: 1/2 inch (in interior walls).

3. Roof Drainage Above Grade:

a. Glass Fiber Insulation:

1) Pipe Size Range: all sizes.

2) Thickness: 1 inch.

4. Domestic Hot Water Recirculation:

a. Glass Fiber Insulation:

1) Pipe Size Range: All sizes.

2) Thickness: 1 inch.

5. Sanitary Piping Above Ceilings:

a. Glass Fiber Insulation:

1) Pipe Size Range: all sizes.

2) Thickness: 1 inch.

B. Cooling Systems:

1. Condensate Drains from Cooling Coils: 1/2 inch thickness; cellular insulation.

2. Refrigerant Suction: 3/4 inch thickness; cellular insulation.

3. Refrigerant Hot Gas: 3/4 inch thickness; cellular insulation.

END OF SECTION

SECTION 22 10 05

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.
3. Storm water.
4. Gas.
5. Flanges, unions, and couplings.
6. Valves.
7. Flow controls.
8. Check.
9. Water pressure reducing valves.
10. Relief valves.
11. Strainers.

1.2 RELATED REQUIREMENTS

A. Section 22 01 00 - General Plumbing Provisions.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 07 19 - Piping Insulation.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

K. ASTM B32 - Standard Specification for Solder Metal; 2020.

L. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

M. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2019.

N. ASTM C4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; 2004 (Reapproved 2014).

O. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2015.

P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

Q. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; latest accepted edition.

R. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

S. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

T. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.

U. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.

V. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

W. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.

X. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; 2019.

Y. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2021.

Z. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

AA. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

BB. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.

CC. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

DD. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

EE. MSS SP-67 - Butterfly Valves; 2022.

FF. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

GG. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

HH. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

II. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

JJ. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

1.4 SUBMITTALS

A. See Section 22 01 00 - General Plumbing Provisions, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Perform Work in accordance with Arkansas, city of Bentonville, Arkansas standards.

C. Valves: Manufacturer's name and pressure rating marked on valve body.

D. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

E. Welder Qualifications: Certified in accordance with ASME (BPV IX).

F. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Arkansas, and city of Bentonville, Arkansas plumbing code.

B. Conform to city of Bentonville, Arkansas code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C 564 neoprene gaskets.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Pipe sizes 4 inches or less: Solvent welded, with ASTM D 2564 solvent cement.

3. Joints: Pipe sizes greater than 4 inch: Push-on, using ASTM F477 elastomeric gaskets.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.

2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Pipe sizes 4 inch and smaller: Solvent welded, with ASTM D 2564 solvent cement.

3. Joints: Pipe sizes greater than 4 inch: Push-on, using ASTM F477 elastomeric gaskets.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C 564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

D. In Fire-rated Walls:

1. Cast iron.

a. Fittings: Cast iron.

E. In Plenum-rated Areas:

1. Cast iron.

a. Fittings: Cast iron.

2.4 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder or mechanical press-fit couplings.

2.5 STORM WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C 564 neoprene gaskets.

B. PVC Pipe: ASTM D 2729.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.6 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C 564 neoprene gaskets.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D 2729.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.7 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe Where Noted: ASTM A 74 service weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C 564 neoprene gaskets.

B. Cast Iron Pipe Where Noted: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

D. In Fire-rated Walls:

1. Cast iron.

a. Fittings: Cast iron.

E. In Plenum-rated Areas:

1. Cast iron.

a. Fittings: Cast iron.

2.8 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, forged steel welding type.

3. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.9 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.

2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

E. Victaulic Devices:

1. Couplings shall consist of a one or more piece ductile or malleable iron cast housing, a synthetic rubber gasket of a central cavity pressure-responsive design, with nuts, bolts, locking toggle or luggs to secure unit together.

a. Coupling housings shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) or malleable iron conforming to ASTM A-47 (Grade 32510), hot dip galvanized to ASTM A-153, or zinc electroplated to ASTM

B-633, as manufactured by Victaulic Company of America. Refer to Victaulic product specifications for other materials.

b. Coatings shall consist of an alkyd enamel paint, or hot-dip galvanizing to ASTM A-153, or zinc electroplating to ASTM B-633, as specified.

2. Couplings for grooved end steel pipe shall be Victaulic couplings for grooved end steel pipe.

a. Line, fittings and valve joints shall be Victaulic flexible (styles 75, 77, 78, or 791) or rigid (styles 005, 07 or HP-70).

b. Rigid joints shall be Victaulic style 07 "Zero-Flex", style HP-70 or style 005 "FireLock" couplings.

c. Pin assembled joints shall be Victaulic style 791 "Vic-Boltless" couplings.

d. Reducing joints shall be Victaulic style 750 Reducing Couplings for pipe to pipe joints or to create reducing fittings using straight fitting configurations.

e. Outlets: All joints designated Outlet Couplings, or where feasible to replace reducing outlet tees, shall be Victaulic style 72 Outlet Couplings (specify grooved, female or male threaded outlet).

f. Flanged Connections shall be Victaulic style 741 (2-24") "Vic-Flange" adapters, engaging directly into grooved pipe and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components or style 743 (2-12") for ANSI Class 300 flanged components; installer to supply standard flange bolts.

g. Quick disconnects shall be Victaulic style 78 "Snap-Joint" Couplings or style 780/781 for double grooved pipe.

3. Gasket shall be molded of synthetic rubber in a central cavity, pressure-responsive configuration conforming to the pipe outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Victaulic Gaskets for proper gasket selection for the intended service.

a. Water service: Gasket supplied for water services from -30 degrees F to +230 degrees F, shall be a Grade "E" EPDM compound, with green color code, molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F17Z, recommended for hot water service within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.

4. Bolts and nuts shall be heat treated carbon steel, track head, conforming to physical properties of ASTM A-183 minimum tensile 110,000 psi, black, or zinc electroplated to ASTM B-633, as supplied or specified.

5. Fittings shall be Victaulic full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept Victaulic grooved end couplings.

    a. Standard fittings shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12), or malleable iron conforming to ASTM A-47, Grade 32510, painted with alkyd enamel or hot-dip galvanized to ASTM A-153 or zinc electroplated to ASTM B-633 or cadmium plated to ASTM A-165 as required.

    b. Standard steel fittings including large size elbows (16-24") shall be forged steel conforming to ASTM A-234 Grade WPB (0.375" wall), painted with alkyd enamel or hot-dip galvanized to ASTM A-153.

6. Branch outlets for hole cut steel pipe shall be Victaulic hole cut products.

7. Branch outlets shall be made with Victaulic style 920, 921 or 929 "Mechanical-T" branch connections with locating collar or foot engaging into hole. (Specify outlet/branch connection type - grooved, female threaded or FIT, as available.)

8. Gauge, meter outlets for hole cut steel pipe shall be Victaulic strapless mechanical outlet products style 923 "Vic-Let" or 924 "Vic-O-Well" and shall provide a pipe outlet without a need for a strap or lower housing to wrap around the pipe.

9. Flow indicators for hole cut steel pipe shall be Victaulic style 736 Waterflow Indicators for wet sprinkler systems, to sense water flow to 10 GPM or greater.

10. Fittings for plain end steel pipe shall be Victaulic FIT fittings (sizes 1", 1 1/4", 1 1/2" and 2") with internal pipe stop for uniform takeout dimensions, 1/4-turn positive locking lugs of heat treated carbon steel conforming to AISI C-1022, cadmium plated, with externally locked-position indicator for inspection or connection of plain end steel pipe. FIT fittings shall have self-contained, pressure responsive gaskets: for water service (-30 degrees to +230 degrees F) Grade "E"; FIT silicone Grade "L" (-30 degrees to +160 degrees F) are recommended for fire protection dry systems, all systems operating below 0 degrees F, plus dry heat, air without hydrocarbons, certain chemical services and water to +160 degrees F. FIT Nitrile gaskets Grade "T" (0 degrees to +180 degrees F) are recommended for petroleum products, hydrocarbons, air without hydrocarbons, except hot dry air over +140 degrees F, vegetable and mineral oils within the specified temperature range. Not recommended for hot water services.

11. Reducing outlet tees shall be Victaulic FIT style 96 with female threaded outlet (specify 1/2, 3/4 or 1" outlet) for direct sprinkler head, sprig or drop nipple connections.

12. 90 degree elbows shall be Victaulic FIT style 969.

13. FIT Outlet/Mechanical-T shall be Victaulic FIT style 929 with FIT locking lug branch outlet (specify 1 1/4, 1 1/2 or 2" outlet) for direct branch connections.

14. Straight tees shall be Victaulic FIT style 963.

15. Straight couplings shall be Victaulic FIT style 960.

16. Reducing elbows shall be Victaulic FIT style 966 with female threaded outlet (specify 1/2, 3/4, or 1" outlet) for direct sprinkler head, sprig or drop nipple connections.

2.10 MECHANICALLY FORMED TEE FITTINGS

A. Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.

B. Branch tubes shall not restrict the flow in the main tube. Mechanical Contractor shall insure the branch tube penetration into the collar is of the correct depth.

C. Mechanically formed tee fittings shall be cleaned and brazed with filler material conforming to AWS A5.8.

2.11 PRESS FITTINGS

A. Fittings shall comply with NSF 61, CSA, UPC and be approved by the local jurisdiction. Wrot copper press fittings shall be made from commercially pure copper mill products per ASTM B 75 Alloy C12200. Cast copper alloy press fittings shall be made from materials with a minimum of 78% copper and a maximum of 15% zinc. The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall have a maximum non-shock working pressure of 200 PSI between the temperatures of -20°F and +250°F. Elastomeric seals shall be made of EPDM material, and the fittings shall be manufactured with an inboard bead design. All fittings shall be installed in accordance with the manufacturer's installation instructions and according to local plumbing and mechanical codes. The press-to-connect joint shall be made with pressing tools and jaw sets recommended and authorized by press fitting manufacturer.

2.12 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.

3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.

6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.

7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.

8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

10. Vertical Support: Steel riser clamp.

11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

12. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.13 GATE VALVES

A. Manufacturers:

1. Conbraco Industries.

2. Nibco, Inc.

3. Milwaukee Valve Company.

4. Crane Co.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Up To and Including 2 1/2 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

C. 3 Inches and Larger:

1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.14 GLOBE VALVES

A. Manufacturers:

1. Conbraco Industries.

2. Nibco, Inc.

3. Milwaukee Valve Company.

4. Crane Co.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Up To and Including 2 1/2 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

C. 3 Inches and Larger:

1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.15 BALL VALVES

A. Manufacturers:

1. Conbraco Industries.

2. Nibco, Inc.

3. Milwaukee Valve Company.

4. Crane Co.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends with union.

2.16 PLUG VALVES

A. Manufacturers:

1. Conbraco Industries.

2. Nibco, Inc.

3. Milwaukee Valve Company.

4. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Construction 2-1/2 Inches and Larger: 1, 250 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.17 BUTTERFLY VALVES

A. Manufacturers:

1. Hammond Valve.

2. Crane Co.

3. Milwaukee Valve Company.

4. Stockham.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, elastomer coated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 6 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.18 FLOW CONTROLS

A. Manufacturers:

1. ITT Bell & Gossett.

2. Griswold Controls.

3. Taco, Inc.

4. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet , blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi.

2.19 SWING CHECK VALVES

A. Manufacturers:

1. Hammond Valve.

2. Nibco, Inc.

3. Milwaukee Valve Company.

4. Crane Co.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Up to 2 Inches:

1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

C. Over 2 Inches:

1. 1, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.20 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Hammond Valve.
2. Crane Co.
3. Milwaukee Valve Company.
4. Stockham.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.21 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Amtrol Inc.
2. Cla-Val Co.
3. Watts Regulator Company.
4. Spence Engineering Co.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Up to 2 Inches:

1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:

1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.22 RELIEF VALVES

2.23 STRAINERS

2.24 RELIEF VALVES

A. Pressure Relief:

1. Manufacturers:

a. Cla-Val Co.

b. Henry Technologies.

c. Watts Regulator Company.

d. Spence Engineering Co.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

B. Temperature and Pressure Relief:

1. Manufacturers:

a. Cla-Val Co.

b. Henry Technologies.

c. Watts Regulator Company.

d. Spence Engineering Co.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.25 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc.

2. Green Country Filtration.

3. WEAMCO.

4. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

C. Size 5 inch and Larger:

1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Re fe rt

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

I. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

Q. Install water piping to ASME B31.9.

R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

S. Sleeve pipes passing through partitions, walls and floors.

T. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

U. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Provide hangers adjacent to motor driven equipment with vibration isolation.
10. Support cast iron drainage piping at every joint.

V. Where water pressure within the building exceeds 75 psi static, install an approved water-pressure reducing valve conforming to ASSE 1003 with strainer to reduce the building pressure to 75 psi static or less.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install ball valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide ball valves in natural gas systems for shut-off service.

I. Provide flow controls in water recirculating systems where indicated.

J. All sanitary waste and vent pipe installed above grade in fire-rated walls, fire-rated plenum spaces or return air plenums shall be cast iron.

3.5 TOLERANCES

A. Drainage Piping: Maintain invert elevations within 1/4 inch vertically of location indicated on drawings. Slope to drain at minimum of 1/4 inch per foot slope for pipes 3 inch and smaller and 1/8 inch per foot slope for pipes larger than 3 inch.

B. Contractor must maintain inverts as indicated on the drawings. The contractor shall employ the latest precision technology available to insure the accuracy of the installation. If the contractor is unable to maintain, the contractor should notify the engineer IMMEDIATELY to obtain direction.

C. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Arkansas state and local codes.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be

properly connected with slope for drainage and cover to avoid freezing.

B. Connection of dissimilar pipe materials shall be made with the specified adapter couplings.

C. Sewers shall be encased or cradled in concrete where shown on the plans or as directed by the Engineer. Unless otherwise noted on the plans, concrete encasement shall encircle the pipe and shall be a minimum thickness of four inches.

D. Contractor shall connect to existing gas service in accordance with the requirements of local gas service official and all applicable municipal and state regulations. All gas piping shall conform to and be tested in accordance with the local gas company and the Standard Gas Code. Gas piping shall have cathodic protection and all piping subject to natural gas pressure over 15 ounces must be welded. Any charge made by the gas company for placing the valves, piping, and connection to service main shall be borne by this contractor. See plans for extent of piping.

E. This Contractor shall extend the system of gas piping, to the various outlets as indicated on plans, complete with stop ball valves, drip pockets, valves and other accessories that may be required to give proper and adequate service.

F. Provide gas ball valves in final connection to all equipment. Unions will not be permitted, except in final connections to equipment. Proper reducing fittings shall be used. Bushings will not be accepted. Gas piping in building shall be standard weight schedule 40 black steel pipe with malleable fittings, unless contractor wishes to weld all joints. Welded rod shall be of same material as piping. No. 22 bronze welding will be permitted.

G. All underground gas service exterior to the building (5 psi or less) shall be a polyethylene plastic pipe manufactured in accordance with ASTM No. D-2517 or D-2513 and shall be indicated on the pipe. Gas piping shall be laid at least 36" below grade at all points. Provide a #12 THN copper wire in trench with pipe and leave both ends exposed for future accessibility.

H. All gas piping in ground, including service, shall be checked with a "Holiday" detector to assure that the coating is free of holes, voids, contamination, cracks, etc. This test shall be performed after the completion of joint and finish coating and touch-up. This test shall be conducted in the presence of the Owner's inspector and performed by experienced personnel.

I. For corrosion protection, all underground and exposed exterior steel pipe and fittings must be coated and wrapped.

J. Test all gas piping operating at 6 oz. with air pump and mercury gauge to pressure that will maintain 25 psig for 20 minutes and inspected by gas service official.

K. All gas piping operating at more than 1 psig shall be tested at 100 psig for steel and 50 psig for plastic, for a minimum of 15 minutes and inspected by gas service official.

L. The pressure regulator at the building shall be sized, and approved by gas service official.

M. All above ground piping shall be rigid steel pipe designated for natural gas use. Pipe shall be painted with a rust inhibiting primer and a final coat the color of which shall be determined by governing regulations or as directed by the Engineer if no governing regulations exist regarding finish color.

N. All gas piping systems within a building and other above ground gas piping shall be electrically continuous and bonded to a grounded electrode as defined in NFPA 70.

O. Medium and high pressure gas regulators installed in the medium and high pressure gas lines (2 psi or greater) shall comply with the following provisions:

1. Shall be suitable for the inlet and outlet gas pressure.

2. Shall comply with Code and gas official requirements.

3. Shall be accessible for servicing.

4. Shall be vented to outdoors when located indoors.

5. Shall be installed in the gas piping system so that it cannot be concealed by building construction.

P. Provide a listed shut off valve immediately ahead of and immediately behind each medium pressure regulator.

Q. Underground gas piping shall be installed in a separate ditch.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: 1/2 inches to 1-1/4 inches:

1) Maximum hanger spacing: 8 ft.

2) Hanger rod diameter: 1/4 inch.

b. Pipe size: 1-1/2 inches to 2 inches:

1) Maximum hanger spacing: 8 ft.

2) Hanger rod diameter: 1/4 inch.

c. Pipe size: 2-1/2 inches to 3 inches:

1) Maximum hanger spacing: 8 ft.

2) Hanger rod diameter: 3/8 inch.

d. Pipe size: 4 inches to 6 inches:

1) Maximum hanger spacing: 8 ft.

2) Hanger rod diameter: 3/8 inch.

e. Pipe size: 8 inches to 12 inches:

1) Maximum hanger spacing: 10 ft.

2) Hanger rod diameter: 1/2 inch.

f. Pipe size: 14 inches and Over:

1) Maximum hanger spacing: 10 ft.

2) Hanger rod diameter: 7/8 inch..

2. Plastic Piping:

a. All sizes:

1) Maximum hanger spacing: 6 ft.

2) Hanger rod diameter: 3/8 inch.

3. Roof Supports:

a. Provide gas piping roof supports as indicated on the plans.

b. Provide condensate piping roof supports as indicated on the plans.

4. Roof Piping Supports:

a. All sizes:

1) Maximum linear pipe spacing: 10 ft.

2) At all changes in direction.

END OF SECTION

SECTION 22 10 06

PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof and Floor drains

B. Cleanouts.

C. Hydrants.

D. Refrigerator valve and recessed box.

E. Mixing valves.

F. Relief valves.

G. Thermostatic mixing valves.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 40 00 - Plumbing Fixtures.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

C. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

D. PDI-WH 201 - Water Hammer Arresters; 2017.

1.4 SUBMITTALS

A. See Section 22 01 00 - General Plumbing Provisions, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Project Record Documents: Record actual locations of equipment and cleanouts ____.

F. Operation Data: Indicate frequency of treatment required for interceptors.

G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Loose Keys for Outside Hose Bibbs: Four.

I. Product Data: Manufacturer’s standard data sheets describing components including materials, dimensions, relationship to adjacent construction, and attachments.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 DRAINS

A. Manufacturers:

1. Josam Company.
2. Jay R. Smith Manufacturing Company.
3. Zurn Industries, Inc.
4. Wade Tyler Pipe.
5. MIFAB, Inc.
6. Watts Water Technologies.
7. Striem, Edwardsville, KS USA
8. Schier Products Company, Edwardsville, KS USA

9. Substitutions: See Section 22 10 00 - General Plumbing Provisions.

B. Roof Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable cast iron dome with vandal proof screws.
4. Accessories: Coordinate with roofing type, refer to roof section. ____
    a. Membrane flange and membrane clamp with integral gravel stop.
    b. Adjustable under deck clamp.
    c. Roof sump receiver.
    d. Waterproofing flange.
    e. Controlled flow weir.
    f. Leveling frame.
    g. Adjustable extension sleeve for roof insulation.
    h. Perforated or slotted ballast guard extension for inverted roof.

C. Roof Overflow Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable cast iron dome with vandal proof screws.
4. Accessories: Coordinate with roofing type, refer to roof section. ____
    a. Membrane flange and membrane clamp with integral gravel stop.
    b. Adjustable under deck clamp.
    c. Roof sump receiver.
    d. Waterproofing flange.
    e. Controlled flow weir.
    f. Leveling frame.

g. Adjustable extension sleeve for roof insulation.

h. Perforated or slotted ballast guard extension for inverted roof.

D. Downspout Nozzles and Boots:

1. Bronze round with straight bottom section.

2. Bell reducer with cap. Size bell reducer as required to fit downspout. Cut cap to match size of downspout and seal around downspout watertight.

3. Cast iron coated rectangular downspout boot with no-hub outlet and securing strap.

E. Floor Drain:

1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.

2.2 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company.

2. Josam Company.

3. Ward Manufacturing, Inc.

4. Zurn Industries, Inc.

5. Wade Tyler Pipe.

6. Watts Water Technologies.

7. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Cleanouts at Exterior Surfaced Areas:

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed tractor-type cover.

D. Cleanouts at Interior Finished Wall Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

E. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.3 HYDRANTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company.
2. Zurn Industries, Inc.
3. Wade Tyler Pipe.
4. Woodford.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome plated lockable recessed box hose thread spout, lockshield and removable key, and integral vacuum breaker.

C. Roof Hydrants:

1. Hydrant shall be freeze proof, backflow protected, Woodford Model SRH-MS, or equal.
2. Hydrant shall meet ASSE 1057
3. The hydrant shall not require a drain line. Venturi action shall draw water out of the internal reservoir and discharge out the backflow preventer.
4. Provide backflow preventer.
5. Provide mounting system.

2.4 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:

1. Guy Gray Manufacturing.
2. IPS Corporation/Water-Tite.
3. Oatey.

4. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Valve Manufacturers:

1. Guy Gray Manufacturing.

2. IPS Corporation/Water-Tite.

3. Zurn Industries, Inc.

4. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

C. Description: Painted metal preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.5 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries.

2. Valve Solutions, Inc.

3. Watts Regulator Company.

4. Zurn Industries, Inc.

5. FEBCO.

6. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Reduced Pressure Backflow Preventers:

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.6 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company.

2. Watts Regulator Company.

3. Zurn Industries, Inc.

4. Wade Tyler Pipe.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.7 INTERCEPTORS

A. Manufacturers:

1. ACO International.

2. Jay R. Smith Manufacturing Company.

3. Zurn Industries, Inc.

4. Wade Tyler Pipe.

5. Peterson Concrete Tank Co.

6. Schier Products.

7. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Indoor/Outdoor Oil Seperator

1. Model: Striem Oil Reserve Series Model No. OS-75

2. Description: None - N/AStriem Oil Reserve™ oil/sand separator model # ____ shall be lifetime guaranteed and made in USA of Polyethylene. Separator shall be furnished for above or below grade installation, with field adjustable riser system, built-in flow control, vent connections and optional oil draw-off for connection to independent collection tank.

3. Capacities:

a. Seperator Flow Rate: 50 gpm.

b. Liquid: 110 Gallons.

c. Oil: 27.5 gallons.

d. Solids: 11 gallons.

4. Optional: Add Clean Sweep oil coalescing media for effluent quality of 5ppm (mg/L) oil content.

2.8 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:

a. ESBE.

b. Leonard Valve Company.

c. Honeywell Water Controls.

d. Powers Process Controls.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

3. Accessories:

a. Check valve on inlets.

b. Volume control shut-off valve on outlet.

c. Stem thermometer on outlet.

d. Strainer stop checks on inlets.

4. Cabinet: 16 gage stainless steel, for surface mounting with keyed lock.

B. Pressure Balanced Mixing Valves:

1. Manufacturers:

a. Delta Faucet Company.

b. H.G. Specialties.

c. Powers Process Controls.

d. Taconova.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. Valve: Chrome plated cast brass body, stainless steel cylinder, integral temperature adjustment.

3. Accessories:

a. Volume control shut-off valve on outlet.

b. Stem thermometer on outlet.

c. Strainer stop checks on inlets.

d. Cabinet: 16 gage stainless steel, for surface mounting with keyed lock.

2.9 CATCH BASINS AND MANHOLES

A. Manufacturers:

1. Choctaw Inc.

2. Kistner Concrete Products, Inc:

3. Sherman Dixie Concrete Industries.

4. Zurn.

5. Substitutions: Substitutions: See Section 22 01 00 - General Plumbing Provisions..

B. Catch Basins:

1. Description: ASTM A536-87, Grade 80-55-063. 0% water absorbent High Density Polyethylene,

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade. Refer to plans for detail.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; janitor rooms, flush valves, interior and exterior hose bibbs.

E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories,sinks, and water closets.

F. Install components in accordance with manufacture's instructions and approved product data submittals.

END OF SECTION

SECTION 22 10 08

PLUMBING SOLDER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Lead-free plumbing solder.

1.2 RELATED SECTIONS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 40 00 - Plumbing Fixtures.

1.3 REFERENCES

A. ASTM B 32 - Standard Specification for Solder Metal; 1996.

B. NSF 61 - Drinking Water System Components - Health Effects; 2002 (ANSI/NSF 61).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: The Harris Products Group

B. Substitutions: See Section 22 01 00 - General Plumbing Provisions for equipment and material substitutions.

C. Provide all plumbing solder from a single manufacturer.

2.2 MATERIALS

A. Plumbing Solder: Sterling® solder or equal, ASTM B 32, Alloy Grade TC; 95 percent tin, 4.85 percent copper, 0.15 percent selenium.

1. Certified to comply with NSF 61.

2. Melting Temperature: 410 degrees F.

3. Tensile Strength: 7,130 psi.

4. Shear Strength: 5,979 psi.

5. Elongation Percent: 19.1.

6. Brinell Hardness: 15.1.

7. Burst Strength: 5,800 psi.

8. Pressure/Temperature Test Data on Copper Tube Assemblies comprised of 3 inch, 2 inch, 1 inch, 3/4 inch, and 1/2 inch Tubing with a Reducing Tee:

   a. No leaks at 70 degrees F., 200 psi, held for 2 minutes.

   b. No leaks at 180 degrees F., 200 psi, held for 2 minutes.

   c. No leaks at 70 degrees F., 2,000 psi, held for 5 minutes.

B. No lead in plumbing solder.

PART 3 EXECUTION

3.1 INSTALLATION

A. Apply plumbing solder in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Emergency eye and face wash.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 10 06 - Plumbing Specialties.

C. Division 26 - Equipment wiring, electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

B. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

D. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

E. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

F. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

G. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. Section 22 01 00 - General Plumbing Provisions: Procedures for submittals.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

A. Provide five year manufacturer warranty for drinking fountain.

B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.

1. Bowl: Height as indicated on plans, with elongated rim.

2. Flush Volume: 1.6 gallon, maximum.

3. Flush Valve: Exposed (top spud).

a. Dual-Filtered Bypass.

4. Flush Operation: Manual, oscillating handle.

5. Manufacturers:

a. American Standard Inc.

b. Kohler Company.

c. Zurn Industries, Inc.

d. Sloan.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Flush Valves: ASME A112.18.1, diaphragm type, dual-filtered bypass, complete with vacuum breaker stops and accessories.

1. Manufacturers:

a. Sloan Valve Company.

b. Substitutions: Not permitted.

C. Seats:

1. Manufacturers:

a. Beneke Magnolia.

b. Bemis Manufacturing Company.

c. Church Seat Company.

d. Olsonite.

e. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

2. Solid white plastic, open front, self-sustaining hinge, brass bolts, without cover.

2.3 LAVATORIES

A. Lavatory Manufacturers:

1. American Standard Inc.

2. Zurn Industries, Inc.

3. Kohler Company.

4. Sloan.

5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Vitreous China Wall Hung Basin:

1. ASME A112.19.2; vitreous china wall hung lavatory, with 4 inch high back, rectangular basin with front overflow.

a. Drilling Centers: 4 inch.

C. Supply Faucet Manufacturers:

1. Sloan Valve Company.

2. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow), single lever handle.

E. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2. Offset waste with plug and strainer where required.

3. Wheel handle stops.

4. Rigid supplies.

5. Carrier:

a. Manufacturers:

1) JOSAM Company.

2) Sloan Valve Company.

3) Zurn Industries, Inc.

4) Watts Water Technologies.

5) Substitutions: See Section 22 01 00 - General Plumbing Provisions.

b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

F. All lavatory faucets shall be listed to ASSE 1070 for temperature and pressure protection with a maximum control flow of 0.5 gpm (2.2 lpm). Faucet shall feature a single cartridge design for ease of repair and maintenance and shall provide an approach temperature of no greater than 5ºF (3°C). Faucet shall include integral check valves to prevent cross flow and shall be in compliance with the American with Disabilities Act (ADA). Faucet shall feature ceramic disc mixing and shall be constructed using Lead Free material.

2.4 SINKS

A. Sink Manufacturers:

1. American Standard Inc.
2. Elkay.
3. Kohler Company.
4. Just.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Single Compartment Bowl:

1. ASME A112.19.3; See schedule outside dimensions, 18 gage thick, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
    a. Drain: 1-1/2 inch stainless steel drain.

C. Trim: ASME A112.18.1; chrome plated brass supply with high rise swing spout, water economy aerator with maximum 1.5 gpm flow, wrist blades .

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

2.5 EMERGENCY EYE AND FACE WASH

A. Emergency Wash Manufacturers:

1. Haws Corporation
2. Guardain.
3. Therm-Omega-Tech, Inc.
4. Bradley.
5. Substitutions: See Section 22 01 00 - General Plumbing Provisions.

B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid supplies to fixtures with hand wheel stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, color to match fixture

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

G. Install handicap valve handles to the accessible side.

H. Provide HandiLav or approved equal molded trap and supply insulation kit for all exposed drain and supply handicap lavatories.

I. Install a check valve in the hot and cold water supply lines at every service sink.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

3.8 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated.

1. Water Closet:

a. Standard: 15 inches to top of bowl rim.

b. Accessible: 18 inches to top of seat.

2. Lavatory:

a. Standard: 31 inches to top of basin rim.

b. Accessible: 34 inches maximum to top of basin rim.

c. Youth: Refer to Architectural Plans.

B. Minimum fixture rough-in sizes or as required for particular fixtures.

1. Water Closet (Flush Valve Type):

a. Cold Water: 1 Inch.

b. Waste: 4 Inch.

c. Vent: 2 Inch.

2. Lavatory:

a. Hot Water: 1/2 Inch.

b. Cold Water: 1/2 Inch.

c. Waste: 1-1/2 Inch.

d. Vent: 1-1/4 Inch.

3. Sink:

a. Hot Water: 1/2 Inch.

b. Cold Water: 1/2 Inch.

c. Waste: 1-1/2 Inch.

d. Vent: 1-1/4 Inch.

END OF SECTION

SECTION 23 01 00

GENERAL HVAC PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work covered by Division 23 sections consist of furnishing all labor, equipment, appliances and material for the heating, air conditioning, piping and plumbing systems in strict accordance with Codes, Specifications and the applicable drawings and subject to the terms and conditions of the contract. Include all appurtenances necessary to the proper operation of the systems and equipment specified.

B. General Contractor shall install all concrete pads and bases required for installing mechanical equipment. Mechanical Contractor is responsible for the exact sizes required, location of anchor bolts, etc.

C. Mechanical Contractor shall furnish and install roof-mounted air handler and exhaust fan bases and shall be the manufacturer's base.

D. Some equipment may be furnished by other divisions. Mechanical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the Owner. Furnish the duct, insulation, controls, etc., on all equipment furnished by other divisions.

E. General Contractor shall furnish and install all ceiling access panels required to service mechanical equipment, valves and controls above gyp board or hidden spline ceilings.

1.2 RELATED SECTIONS

A. The General Conditions and Division 1, General Requirements, as bound in the specification preamble, apply to all work under Division 23. Carefully note its contents in performance of the work.

B. The Architectural, Plumbing, Electrical, and Structural plans and Specifications, including Information to Bidders and other pertinent documents issued by the Engineer are a part of this Specifications and the accompanying mechanical plans. Comply with them in every respect. Examine all the above carefully. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, electrical and structural details from the mechanical drawings.

C. All electrical power wiring is specified under Division 26 of the Specifications. Mechanical Contractor shall furnish all motor starters required for the control and

protection of all motors furnished for the Division 23. Provide and install all automatic temperature and interlock wiring required for controlling mechanical equipment furnished under Division 23, in compliance with Division 26 of the Project Manual.

D. All concrete pads and bases required for installing mechanical equipment are specified in another section of the Specifications. Advise the General Contractor as to the exact sizes required, location of anchor bolts, etc.

E. Paint all roof top mechanical equipment ducts, supports and other exposed material. Do not paint indoor equipment supplied with painted finish, such as the main mechanical equipment unless damaged during handling and installation. In such cases, use touch-up paint of the same type and color as original paint. Conform to requirements in other sections of the Specifications and match wall finish to the room in which installed.

1.3 CODES, FEES AND LATERAL COSTS

A. Comply with all applicable codes, specifications, local ordinances, industry standards, utility company regulations, and the applicable requirements of the following latest nationally accepted codes and standards:

1. Bentonville, Arkansas City Building Code.
2. Arkansas State Mechanical Code; latest accepted edition.
3. Arkansas State Plumbing Code; latest accepted edition.
4. Arkansas Energy Code; latest accepted edition.
5. IBC - International Building Code; latest accepted edition.
6. IFC - International Fire Code; latest accepted edition.
7. IGC - International Gas Code; latest accepted edition.
8. IMC - International Mechanical Code; latest accepted edition.
9. IPC - International Plumbing Code; latest accepted edition.
10. IECC - International Energy Conservation Code
11. AMCA - Air Moving & Conditioning Association.
12. ASA - American Standards Association.
13. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.

14. ASME - American Society of Mechanical Engineers.
15. ASTM - American Society of Testing Materials.
16. AWWA - American Water Works Association.
17. NBS - National Bureau of Standards.
18. NEMA - National Electrical Manufacturers Association.
19. NFPA - National Fire Protection Association.
20. SMACNA - Sheet Metal & Air Conditioning Contractors' National Association.
21. UL - Underwriters' Laboratories, Inc.
22. AGA - American Gas Association.
23. OSHA - Occupational Safety and Hazard Association.
24. AABC - Associated Air Balance Councils
25. NEBB - National Environmental Balancing Bureau

B. Comply with State of Arkansas adopted ADA Accessible Guidelines in regard to accessible or handicapped features.

C. In case of difference between building codes, Specifications, state Laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent governs. Promptly notify the Engineer in writing of any such difference.

D. Remove any work installed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, correct the deficiencies, and reinstall all work at no cost to the Owner.

E. The mechanical drawings show the general arrangement of all piping, equipment and appurtenances. Follow as closely as actual building construction and the work of other trades will permit. Final layout will be governed by actual field conditions with all measurements verified at the site. Conform to the requirements shown on all of the drawings. General and structural drawings take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate the existing and finish conditions affecting the work and arrange the work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions. Contractor shall verify that all equipment, ducts, pipes and all other

components will fit in the space provided before fabrication or ordering.

F. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith. Arrange with the serving utility companies for the connections to all utilities and pay all charges for same including inspection fees and meters if required. Refundable deposits will be paid by the Owner.

1.4 GUARANTEE

A. Furnish a written certificate guaranteeing all materials, equipment and labor furnished to be free of all defects for a period of one (1) year from and after the date of final acceptance of the work by the Owner and further guarantee to replace such work without charges if any defects appear within the stipulated guaranty period.

1.5 SOIL CONDITIONS

A. The Specifications and the drawings in no way imply the conditions of the soil to be encountered. When excavating may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions affecting the work.

1.6 INSPECTION OF PREMISES

A. Before submitting a bid, visit the site of the proposed job and determine the conditions relating to this work.

1.7 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. Verify the location and elevation of all utilities and their relation to the work before entering into a contract.

1.8 EXISTING BUILDING AND EXISTING MECHANICAL EQUIPMENT

A. Visit the existing building and become thoroughly acquainted with the existing physical plant, mechanical systems and utilities in order to determine all of the work that will be necessary to carry out the intent of the plans and specifications.

B. If it is necessary, in any way, to interfere with normal operations of the existing utilities in order to carry out the work, give notice and obtain written approval from the Owner before the work is started.

1.9 EQUIPMENT NOT SPECIFIED UNDER DIVISION 23

A. Equipment which requires plumbing and other mechanical connections may be specified in another division of this Specification. Under these conditions, provide necessary utilities including waste, water, natural gas, duct, insulation and controls.

B. Rough-in work from approved shop drawings only.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Provide new materials bearing the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. Furnish the standard product of a manufacturer regularly engaged in the production of the required type of equipment. Provide the manufacturer's latest approved design.

B. Deliver equipment and materials to the site and store in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage (such as controls) in dry, heated spaces.

C. Provide equipment and materials of the same general type and of the same make throughout the work to provide uniform appearance, operation and maintenance.

D. Tightly cover equipment and protect against dirt, water and chemical or mechanical injury and theft. At the completion of the work, clean fixtures, equipment and materials and polish thoroughly. Turn over to the Owner in a condition satisfactory to the Engineer. Repair damage or defects developing before acceptance of the work at no expense to the Owner.

E. Insure that items to be furnished fit the space available. Make necessary field measurements to ascertain space requirements, including those for connections. Furnish and install such sizes and shapes of equipment that the final installation suits the true intent and meaning of the drawings and Specifications.

F. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Promptly notify the Engineer in writing of any conflicts between any requirements of the Contract Documents and the manufacturers' directions. Obtain the Engineer's written instruction before proceeding with the work. Replace any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, at no cost to the Owner.

G. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.

H. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 EQUIPMENT ACCESSORIES

A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.

B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and Specifications.

C. Support, plumb, rigid and true to line, all work and equipment furnished. Study thoroughly all general, structural, electrical, fire suppression and mechanical drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.

D. If accessories are required to complete the work and meet the intent of the specification, it is the responsibility of the Contractor to provide such accessories.

2.3 MATERIAL AND EQUIPMENT SCHEDULE

A. Submit to the Engineer as soon as practical, six (6) complete sets of the schedule of materials and equipment proposed for the installation, or electronic submittals as detailed below. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data and submit under one cover with an index sheet in front.

1. If Electronic files are submitted, a complete set of the schedule of materials and equipment proposed for the installation shall be included. Include manufacturers' names, catalog data, diagrams, drawings and other descriptive data. All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files according to the corresponding specification section (i.e. "23 40 00 - Air Cleaning Devices.pdf"). Unless incomplete submittals are authorized by the project engineer, all Division 23 submittals shall be electronically sent at one time. Without authorization, incomplete submittals shall be rejected.

B. Provide written certification that shop drawings are in accordance with the specifications and are dimensionally correct with reference to available space.

C. All submittals will be reviewed a maximum of two (2) times. The cost of additional submittal reviews beyond those two specified will be charged to the Contractor.

D. Shop drawings for the Engineer's files are required on the following items:

1. Roof Top Air Handling Units.

2. Infrared Heaters.

3. Mini-Split HVAC Units.

4. Filters.

5. Wall Louvers.

6. Exhaust Fans.

7. Valves/Circulation Pumps/Flex Connectors and other Specialties.

8. Grilles and Registers.

9. Starters.

10. Controls and Instrumentation.

11. Air Balance Certification.

12. Ductwork Materials Including Duct Accessories.

13. Duct Insulation Materials.

14. Complete Mechanical Equipment Electrical Data and Wiring Details.

15. Controls - Including Sequences of Operation specific to the job.

2.4 EQUIPMENT AND MATERIAL SUBSTITUTIONS

A. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The Mechanical Contractor shall be responsible for any changes required in mechanical, electrical, structural or vibration isolation systems and shall bear all cost for those changes whether the substitute equipment is named by manufacturer in the specifications or is submitted to the Architect for "or equal" consideration. All changes shall be accomplished in a manner acceptable to the Architect per Section 01 60 00 at no additional cost to the Owner.

B. In order to obtain prior approval on equipment or material not specified in Division 23 Specifications or Equipment Schedules, Mechanical Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.

C. If ANY substitute equipment is submitted to Engineer for approval, without said equipment having been pre-approved, the entire submittal will be rejected for resubmittal.

D. Any equipment manufacturers which are a subsidiary to the listed acceptable manufacturers are not considered equal. Therefore, it is the responsibility of the Contractor and equipment supplier to obtain prior approval as described in paragraph 2.4, this Section.

2.5 ELECTRICAL MOTORS

A. Provide motors of a recognized manufacturer, wound for the voltage specified, and in conformance to latest standards of the manufacturer and performance of the National Electrical Manufacturers Association and the Institute of Electrical and Electronic Engineers. Provide motors as manufactured by General Electric, Westinghouse, Century or Siemens-Allis, Baldor or approved equal.

B. Provide motors rated for continuous duty at 100% of rated capacity and temperature raise of 40 degrees Centigrade open type; 50 degrees Centigrade drip and splash proof; 55 degrees Centigrade explosion proof and totally enclosed above an ambient of 40 degrees Centigrade.

C. Unless otherwise required, provide integral horsepower, polyphase motors, Class B, general purpose, squirrel cage, open type induction motors, T-frame.

D. Provide single phase fractional horsepower motors of the open capacitor type. Generally, motors under 1/2 horsepower may be split phase type unless otherwise specified. Provide motors rated 1/2 horsepower or less with integral overcurrent protection.

E. Insure the insulation resistance between stator conductor and frames of motors is not less than 1/2 megohm. Provide shop test of motors including temperature rise, insulation resistance, motor terminal voltage, normal operating line current, RPMs, breaker or switch size with fusing and overload relay sizes.

PART 3 EXECUTION

3.1 COORDINATION OF WORK

A. Compare the mechanical drawings and Specifications with the drawings and Specifications for other trades and report any discrepancies between them to the Engineer and obtain from him written instruction for changes necessary in the mechanical work. Install the mechanical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. Make all changes required in the work caused either by neglect or existing field conditions at no cost to the Owner.

B. It is the responsibility of the General Contractor, Plumbing Contractor, Mechanical Contractor and Electrical Contractor, and Sprinkler Contractor to coordinate

installation of all equipment. Equipment installed prior to proper coordination, which interferes with the harmony and intent of the specifications and drawings, will be removed and reinstalled at the cost of the responsible Contractor.

C. Furnish anchor bolts, sleeves, inserts and supports required for the mechanical work. Locate anchor bolts, sleeves, inserts and supports as directed by the trade requiring them and insure that they are properly installed.

D. Slots, chases, openings and recesses in existing structure shall be cut, patched and repaired by the Contractor.

E. Adjust locations of pipes, ducts, equipment fixtures, etc., to accommodate the work and for interferences anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

1. Provide right-of-way to lines that pitch over those that do not pitch. For example, Plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have the right-of-way over lines whose elevations can be changed.

2. Make offsets, transitions and changes in direction in pipes and ducts as required to maintain proper head room and pitch.

F. Install all mechanical work to permit removal without damage to other parts, to coils, fan shafts and wheels, filters, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

G. Change the cross sectional dimensions of ductwork when required to meet job conditions, but maintain at least the same equivalent cross sectional area. Secure the approval of the Engineer prior to fabrication of ductwork requiring such changes. Sizes shown on the plans are clear dimensions; add for internal insulation if specified.

3.2 RECORD DRAWINGS

A. Maintain record drawings showing exact locations and sizes, as actually installed, of piping, drains, cleanouts, ductwork, controls and equipment as specified herein. Deliver to the Owner/Architect upon completion and acceptance of the work, one (1) complete set of contract drawings marked to indicate all deviations from intended installation.

B. Record drawings shall be provide in hard copy form, as well as, on a DVD in PDF form.

3.3 CUTTING AND PATCHING

A. The General Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any major structural element, beam or column without the written approval of the Engineer.

B. Openings in fire or smoke barriers for air handling ductwork or air movement shall be protected in accordance with NFPA 90A and 90B and the Mechanical Code.

C. Pipes, conduits, cables, wires, air ducts, pneumatic tubes and ducts and similar handling service equipment that pass through fire or smoke barriers shall be protected in accordance with NFPA 101.

D. All fire stopping assemblies must be UL approved assemblies.

3.4 EQUIPMENT START-UP AND TESTING

A. Instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment. During the operating tests, prove the operation of each item of equipment to the satisfaction of the Engineer. Give at least seven (7) days notice to the Engineer of equipment start-up and operating tests.

3.5 CATALOG DATA FOR OWNER

A. Provide, in looseleaf binders, two (2) sets of a compilation of catalog data of each manufactured item of equipment used in the mechanical work and present this compilation to the Owner/Architect for transmittal to the Owner before final payment is made. Include descriptive data and printed installation, operating and maintenance instructions for each item of equipment. Provide a complete double index as follows:

1. Listing of products alphabetically by name.

2. Listing the names of manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the names and addresses of the local sales representatives.

3. Certificates of Final Inspections.

4. Complete spare parts data with current prices and supply sources.

5. Extended warranties.

B. Deliver to the Owner all special tools, lubricants, extra materials and any other products necessary for the proper operation and maintenance of the mechanical and plumbing systems.

C. Provide project record documents indicating all changes from contract documents made during construction.

D. Submit all Certificates of Final Inspections from the Administrative Authorities.

E. Submit TAB reports on approved forms. Final TAB report submittals shall include all required rebalances if any are required.

3.6 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. Instruct the representative of the Owner in the proper operation and maintenance of all elements of the mechanical system. Spend not less than five (5) days in such formal instruction and additional time as directed by the Engineer to fully prepare the Owner to operate and maintain the mechanical equipment.

B. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated. Provide the following training as required to fully qualify the Owner's designated personnel. All training must be video taped to a CD and a copy included in each operation and maintenance closeout manual.

1. Air Handling Units: ____ hours.

2. Return Fan/Relief Fan.

3. Mini-Split HVAC Units.

3.7 PROTECTIVE COATINGS

A. Paint exterior surfaces of steel piping run in or through concrete floor fill, under tile floors or underground, and aluminum surfaces in contact with masonry, with one coat of acid resisting bituminous base paint.

B. Paint all exposed galvanized ducts behind grilles flat black.

3.8 NOISE CONTROL

A. It is intended that the mechanical systems as installed under this contract be free from objectionable noise when the system is operating. The system shall operate at noise levels below criteria recommended for the application by ASHRAE. Provide vibration isolation accessories and isolate equipment, pipeline, ductwork, etc., as required so as to insure an acceptable noise level in all of the mechanical systems.

3.9 CLEANING AND ADJUSTING

A. Do not allow waste material and rubbish to accumulate in or above the premises. After completion of this work, remove rubbish, tools, scaffolding and surplus

materials from and about the building and leave all work clean and ready for use. Clean all equipment, pipes, valves and fittings of grease, metal cuttings and sludge. Repair any stoppage, discoloration or other damage to parts of the building, its finish or furnishings due to failure to properly clean the mechanical systems, without additional cost to the Owner. Adjust all automatic control devices for proper operation.

3.10 SYSTEM OPERATING TESTS

A. After the successful completion of all equipment start-up and test requirements, perform the following tests on the complete mechanical systems:

1. First Operating Test by Contractor: Prove the operation of the mechanical systems and of each individual item in the systems. Give at least 10 day prior notice to the Engineer of such tests. Adjust and set proper quantities to all items and equipment. Should any item of the systems fail to perform in an approved manner, repeat this test until approved by the Engineer. During this test, balance circulation of heating and cooling water to balancing cocks, valves, thermostats and similar Items to insure that the mechanical systems perform as intended.

2. Checking by Owner and Engineer: Following the successful completion of first operating tests by the Contractor, the Owner and the Engineer have the privilege of making such tests as they may desire during a period of three weeks to ascertain in detail if any corrections are to be made to the system. At the end of the testing by the Owner and the Engineer, the Engineer may direct the Contractor in writing to make such corrections to the systems as are within the scope of the contract.

3. Contractor's Corrections to Systems: Make all required corrections to the systems and notify the Engineer in wiring that the corrections outlined have been completed. Give at least seven (7) days notice of a final three-day operating test.

4. Three-Day Operating Test: Perform an operating test to the satisfaction of the Engineer for a period of three (3) days. Should any element of the systems not perform properly, make all required corrections and repeat the test until successfully performed.

    a. Submit the Form of Record proposed by the Contractor for the recording of all measurements to the Engineer for approval at least two weeks before the approved form will be required by the Contractor.

    b. Measurements: Make the following measurements at two-hour intervals (5 measurements per 8-hour day) during the three-day operating test.

1) Electrical: Running amperes and voltage of each motor 3/4 horsepower or larger.

2) Air temperatures in each heated or air conditioned space and outdoor temperatures.

c. Instruments: Provide all instruments, materials and labor to perform the tests and to obtain and record the measurements specified herein, including the furnishing of all required record forms as approved by the Engineer. Submit for the Engineer's approval, complete shop drawings or catalog data for all instruments to be used for the three day operating test and obtain approval at least two weeks before the instruments will be required for test measurements.

d. Report: Submit four (4) copies of a written report of the three-day operating test on the approved Form of Record to the Engineer for approval and subsequent transmittal to the Owner.

3.11 MOTOR CONTROL

A. General: Provide each motor 1/8 horsepower or larger with a suitable controller and devices that will perform the functions as specified for the respective motors, together with manual reset thermal overload, protection in each undergrounded conductor. Provide the controller either integral with circuit protective device or mounted in separate enclosure. Starters shall be Allen-Bradley, G.E., Westinghouse, Square D or approved equal.

B. Control: Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motor directly, provided the device used is designated for that purpose and has an adequate horsepower rating. When automatic control device does not have such a rating, use a magnetic starter with the automatic control device actuating the pilot control circuit. When combination manual and automatic control is specified and the control device operates the motor directly, provide a manual motor starter and selector switch. When combination manual and automatic control is specified and the automatic control device actuates the pilot control circuit, a magnetic control device actuates the pilot control provided. Provide all magnetic starters with push buttons or selector switches in the covers. Provide connections to the selector switch such that only the normal automatic regulating control devices will be bypassed when the switch is in the manual position. Connect all safety control devices, such as low or high pressure cutouts, high temperature cutouts and motor overload protective devices in the motor control circuit in both the manual and automatic positions of the selector switch control circuit. Make connections to any selector switch or to more than one (1) automatic regulatory control device in accordance with wiring diagrams recommended by the manufacturer

and approved by the Engineer. Where required for manual control, provide push-button stations consisting of two (2) momentary contact operators, 600 volts, 10 amperes installed and wired for three wire control to provide under-voltage relays, auxiliary contacts or other devices required for a complete system.

C. Location: Where the controller is located within sight of the motor driven equipment (fifty feet or less), the controller and circuit protective device shall be capable of being locked in the open position. Where the controller is located out of sight of the motor driven equipment (more than fifty feet) provide a non-fused safety disconnect, suitable for the service, and which opens all ungrounded conductors simultaneously, at or on the motor driven equipment.

D. Enclosure: Enclosure to be general purpose, NEMA Type 1 unless noted otherwise (NEMA Type 1 gasketed). The circuit breaker shall be operable by hand from outside the enclosure and shall be so interlocked with the door or doors that it must be returned to the "OFF" position before the door can be opened.

E. Push-buttons: Provide maintained contact, standard duty type in a general purpose, NEMA Type 1 enclosure for surface mounting rated for 10 amperes continuous at 600 volts or less.

3.12 ACCESS PANELS

A. Provide access panels as required in all walls, ceilings and ductwork to service and have access to all valves, operating parts and duct mounted fire dampers. For all ceiling and wall access doors that are required in gypsum board and plaster, provide minimum 24" x 24", unless due to structural restraints the access door can be reduced to a minimum of 18" x18", Milcor type appropriate for the construction involved.

3.13 TEMPORARY HEATING AND COOLING

A. Permanent heating and cooling systems may be used to provide temporary heating and cooling to the building during construction, if the following requirements are met:

1. Provide filters in equipment filter racks.

2. Provide filter material at entrance to all return air ducts or over permanent return air grilles. All return air ductwork is to be protected from construction dust and debris. If return air duct work is not protected prior to equipment startup for temporary use, the Contractor will pay to have the entire ductwork system of the affected equipment thoroughly cleaned prior to Owner occupancy.

3. Contractor shall provide and pay for operation, maintenance, regular replacement of filters and worn or consumed parts.

4. Shall replace any equipment that is damaged during temporary usage with new equipment.

5. All warranty periods shall not begin until Certificate of Substantial Completion is issued.

6. Verify with engineer that the installation is ready and approved for operation.

B. Just prior to turning the building or portions of the building over to the Owner, Contractor will replace all filters on equipment used for temporary ventilation, heat or cooling during construction.

C. Do not turn water into the system until the systems have been thoroughly cleaned and approved by the Engineer.

3.14 DEMOLITION

A. There are areas in the existing building in which demolition will have to be performed due to the requirements for remodeling. The demolition work involved is not fully described herein; however, the information given on the electrical and mechanical drawings and the information set out in the specifications will substantially serve to inform the mechanical Contractor as to the full extent of the demolition required.

B. Contractor should visit job site to verify extent of demolition required to complete project.

C. It is the intent of this Specification that all required demolition work be fully and completely performed and all work be accomplished in a neat and workmanlike manner.

D. Remove all existing piping, fittings, heating, cooling, ventilation equipment that is required to accomplish the remodel work. All existing utilities that are disconnected shall be capped recessed in walls and floors. Contractor shall be responsible for visiting building and determining the extent of the demolition work. Contractor shall provide any necessary temporary piping required to keep existing building utilities (water, gas and sewer) in operation until new construction is completed to the extent that the new utilities can be reconnected.

E. All rubbish, debris and expendable items resulting from demolition work shall be removed from the premises as it accumulates and disposed of at an off-site location by the Contractor.

3.15 SALVAGE

A. Except as otherwise specified herein, or noted on drawings, the Contractor shall receive title to all building materials indicated to be demolished or removed which are

not specifically designated as being retained by the Owner, said title to vest in the Contractor immediately upon receipt of Work Order. All salvage materials removed shall be taken from the premises promptly, as the storage of salvage materials on the site will not be permitted. Bidders shall take into account the salvage value to them of materials removed and such value shall be reflected in the bids.

B. All items of usable equipment shall remain the property of the Owner. All such items of equipment which are to be removed and which are not to be reused shall be stored on the premises by the Contractor as directed by the Owner.

C. Usable items shall be determined by the Owner and shall include existing heating and cooling pumps and other equipment so designated as "usable" by the Owner.

3.16 FINALLY

A. It is the intention that this specification shall provide a complete installation except as herein before specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.3 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number. Valve locations with tag numbers shall also be indicated on "as-built" drawings.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Dampers: Ceiling tacks, where located above lay-in ceiling.

B. Ductwork: Stencilled painting.

C. Instrumentation: Tags.

D. Relays: Tags.

E. Small-sized Equipment: Tags.

F. Thermostats: Nameplates.

G. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Manufacturers:

1. Advanced Graphic Engraving.
2. Kolbi Pipe Marker Co.
3. Seton Identification Products.
4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/2 inch.
3. Background Color: Black.
4. Plastic: Conform to ASTM D709.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving.
2. Brady Corporation.
3. Kolbi Pipe Marker Co.
4. Seton Identification Products.
5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame. Valve tag chart should should indicate valve size, valve model and valve location. Valve locations with tag numbers shall also be indicated on "as-built" drawings.

2.4 STENCILS

A. Manufacturers:

1. Brady Corporation.

2. Kolbi Pipe Marker Co.

3. Seton Identification Products.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.

5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.

6. Ductwork and Equipment: 2-1/2 inch high letters.

2.5 CEILING TACKS

A. Manufacturers:

1. Craftmark.

2. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. Yellow - HVAC equipment.

2. Red - Fire dampers/smoke dampers.

3. Blue - Heating/cooling valves.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 91 00 for stencil painting.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

D. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.3 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Architect.

2. Submit six weeks prior to starting the testing, adjusting, and balancing work.

3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.

4. Include at least the following in the plan:

a. Preface: An explanation of the intended use of the control system.

b. List of all air flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Identification and types of measurement instruments to be used and their most recent calibration date.

e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

f. Final test report forms to be used.

g. Detailed step-by-step procedures for TAB work for each system and issue, including:

    1) Terminal flow calibration (for each terminal type).

    2) Diffuser proportioning.

    3) Branch/submain proportioning.

    4) Rechecking.

    5) Diversity issues.

h. Expected problems and solutions, etc.

i. Criteria for using air flow straighteners or relocating flow stations and sensors .

j. Details of how TOTAL flow will be determined; for example:

    1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

k. Specific procedures that will ensure that air side is operating at the lowest possible pressures and methods to verify this.

l. Confirmation of understanding of the outside air ventilation criteria under all conditions.

m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

n. Method of checking building static and exhaust fan and/or relief damper capacity.

o. Methods for making coil or other system plant capacity measurements, if specified.

p. Time schedule for TAB work to be done in phases (by floor, etc.).

q. Description of TAB work for areas to be built out later, if any.

r. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

s. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

t. Procedures for formal progress reports, including scope and frequency.

u. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least once a week to Construction Manager and Engineer. Field logs should be submitted with weekly progress reports and include a record of all discrepancies and issues encountered during the period covered.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the Construction Manager, HVAC controls contractor, and Engineer within two weeks after completion of testing, adjusting, and balancing.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.

3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

7. Units of Measure: Report data in I-P (inch-pound) units only.

8. Include the following on the title page of each report:

    a. Name of Testing, Adjusting, and Balancing Agency.

    b. Address of Testing, Adjusting, and Balancing Agency.

    c. Telephone number of Testing, Adjusting, and Balancing Agency.

    d. Project name.

    e. Project location.

    f. Project Architect.

    g. Project Engineer.

    h. Project Contractor.

    i. Project altitude.

    j. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC MN-1, AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of two years documented experience.

3. Certified by one of the following agencies or methods:

a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.

b. NEBB, National Environmental Balancing Bureau: www.nebb.org.

c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

d. Test and Balance under direct supervision of a Professional Engineer registered in the State of Arkansas.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

F. Acceptable TAB Agencies:

1. NEBB.

2. AABC.

3. SMACNA.

4. TABB.

5. Substitutions: Not permitted.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions. Since work will occur in phases, provide listing of system deficiencies for systems to be balanced during the specified phases.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply and outside air systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.

3. Contract interpretation requests.

4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

I. After all adjustments and corrections have been performed to balance system as designed, additional readjustment shall be performed to satisfy desired temperature.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities . Test and balance all air handlers for the three design positions i.e. minimum (5% adjustable) outside air, design outside air and economizer operation.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions.

L. Measure building static pressure and adjust supply, return, barometric relief dampers, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. Measure and record supply, return, outside and exhaust air cfm, fan rpm, motor amps, coil entering and leaving air, temperatures (both wet and dry bulb temperatures),

outside air (wet and dry bulb temperatures) for cooling and heating operations, system static pressures shall be measured at the required conditions at the minimum and maximum fan speeds.

O. Measure and record the following air handling and distribution systems.

1. Supply, return, outside air and exhaust when system is in the economizer operation. Measure and record supply air and outside air temperatures (both wet and dry bulb).

3.7 SCOPE

A. Test, adjust, and balance the following:

1. Packaged Roof Top Heating/Cooling Units
2. Fans.
3. Air Filters.
4. Air Inlets and Outlets.

3.8 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

B. V-Belt Drives:

1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM

4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Combustion Equipment:

1. Boiler manufacturer
2. Model number
3. Serial number
4. Firing rate
5. Overfire draft
6. Gas meter timing dial size
7. Gas meter time per revolution
8. Gas pressure at meter outlet
9. Gas flow rate
10. Heat input
11. Burner manifold gas pressure
12. Percent carbon monoxide (CO)
13. Percent carbon dioxide (CO2)
14. Percent oxygen (O2)
15. Percent excess air
16. Flue gas temperature at outlet
17. Ambient temperature
18. Net stack temperature
19. Percent stack loss
20. Percent combustion efficiency
21. Heat output

D. Air Cooled Condensers:

1. Identification/number
2. Location
3. Manufacturer
4. Model number
5. Serial number
6. Entering DB air temperature, design and actual
7. Leaving DB air temperature, design and actual
8. Number of compressors

E. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

F. Return Air/Outside Air:

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

G. Exhaust Fans:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

H. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

I. Flow Measuring Stations:

1. Identification/number
2. Location
3. Size
4. Manufacturer
5. Model number
6. Serial number
7. Design Flow rate
8. Design pressure drop
9. Actual/final pressure drop
10. Actual/final flow rate
11. Station calibrated setting

J. Terminal Unit Data:

1. Manufacturer

2. Type, constant, variable, single, dual duct
3. Identification/number
4. Location
5. Model number
6. Size
7. Minimum static pressure
8. Minimum design air flow
9. Maximum design air flow
10. Maximum actual air flow
11. Inlet static pressure

K. Air Distribution Tests:

1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

D. Adhesive, tie wires, tape

1.2 RELATED REQUIREMENTS

A. Section 23 01 00 - General HVAC Provisions.

B. Section 23 05 53 - Identification for HVAC Piping and Equipment.

C. Section 23 31 00 - Ducts: Glass fiber ducts.

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than five years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with a minimum five years of documented experience and approved by manufacturer.

C. Perform work at ambient and equivalent temperatures as recommended by the adhesive manufacturer. Work shall be performed only by mechanics who regularly perform this type of work only.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

B. Adhesives to be waterproof.

C. Recovering jackets 6 ounce per square yard canvas attached with a lagging fire retardant adhesive. Install on exposed ductwork insulation. Cover thoroughly with several coats of sizing.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation.
2. Johns Manville Corporation.
3. Owens Corning Corp.
4. CertainTeed Corporation.
5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
4. Maximum Moisture Absorption: 0.20 percent by volume.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.

3. Moisture Vapor Transmission: ASTM E 96; 0.02 perm.

4. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. Knauf Insulation.

2. Johns Manville Corporation.

3. Owens Corning Corp.

4. CertainTeed Corporation.

5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Insulation: ASTM C612; rigid, noncombustible blanket.

1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.

2. Maximum service temperature: 450 degrees F.

3. Maximum Water Vapor Sorption: 5.0 percent.

4. Maximum Moisture Absorption: 0.20 percent by volume.

5. Maximum Density: 8.0 lb/cu ft.

6. Density: 3.0 lb/cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.

3. Moisture vapor transmission: ASTM E 96; 0.04 perm.

4. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.

2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.4 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

1. Lagging Adhesive:

a. Compatible with insulation.

B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

C. Aluminum Jacket: ASTM B209 (ASTM B209M).

1. Thickness: 0.016 inch sheet.

2. Finish: Embossed.

3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.5 DUCT LINER

A. Manufacturers:

1. Knauf Insulation.

2. Johns Manville Corporation.

3. Owens Corning Corp.

4. CertainTeed Corporation.

B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; semi-rigid duct liner; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.

1. Fungi Resistance: ASTM G21.

2. Substitutions: See Section 23 01 00 - General HVAC Provisions.

3. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.

4. Service Temperature: Up to 250 degrees F.

5. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.

6. Minimum Noise Reduction Coefficients:

a. 1/2 inch Thickness: 0.30.

b. 1 inch Thickness: 0.45.

c. 1-1/2 inches Thickness: 0.60.

d. 2 inch Thickness: 0.70.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, welded with press-on head.

2.6 MATERIALS

A. External Insulation

1. Concealed Round Ducts: Flexible glass fiber insulation, minimum installed R-value of R-6, with factory applied reinforced aluminum foil vapor barrier for systems conveying air at less than room temperature.

B. Internal Insulation

1. Rectangular Ducts and Plenums: Internal duct insulation shall be semi-rigid duct liner board manufactured from glass fibers bonded with a thermosetting resin. Insulation shall be coated on one side with a fire resistant black coating and shall have a minimum installed R-value of R-6. Duct liner shall be installed by cutting side pieces of insulation to lap both top and bottom sections for maximum support. Install side pieces first. Side pieces and bottom piece shall be attached

with 4" strips of adhesive at one foot intervals. Top section of insulation shall be attached with Stick-Klip fasteners secured by Miracle adhesive spaced one fastener per two square feet of insulation. Edges of insulation shall be butted with adhesive to insure a tight joint and provide a smooth surface.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

C. Finish with system at ambient conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:

1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:

1. Provide with or without standard vapor barrier jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces : Finish with canvas jacket sized for finish painting.

F. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage.

2. Secure insulation with welded mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible and NAIMA Fibrous Glass Duct Liner Standards (latest edition) for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Exhaust Ducts: Externally wrap.

B. Outside Air Intake Ducts:

1. Round: Externally insulate with 2- inch thick insulation.

2. Rectangular: Internally insulate with 1-inch thick semi-rigid duct liner with adhesive and welded mechanical fasteners.

C. Concealed Supply Ducts:

1. Round Duct: Externally insulate with 2- inch thick insulation.

2. Rectangular: Internally insulate with 1-inch thick, semi-rigid duct liner..

D. Concealed Return Air Ducts and Plenums:

1. Round: Externally insulate with 2-inch thick insulation.

2. Rectangular: Internally insulate with 1-inch thick.

END OF SECTION

SECTION 23 09 23

DDC CONTROLS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. System shall be an extension of existing control system.

B. Furnish a complete system of temperature and ventilation controls in accordance with this specification section. Items of work included are as follows.

1. Provide all necessary hardware and software to meet the specified functional requirements as put forth in the specification and sequence of operation, as defined on drawings.

2. Prepare individual hardware layouts, interconnection drawings and control loop configuration data from project design data.

3. Implement the detailed design for all system input/output points, distributed control and system data bases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

4. Design all equipment cabinets, panels, and the data communication network cables including all associated hardware.

5. Provide and install all cabinets, panels, and data communication network cables including all associated hardware.

6. Provide and install all interconnecting cables between supplied cabinets, controllers, input devices and output devices.

7. Provide and install all interconnecting cables between all operator terminals and peripheral devices (such as printers, etc.) supplied under this section.

8. Provide complete specifications for all items supplied by others (such as printers, instruments, etc.).

9. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, start-up and commissioning.

10. Provide a comprehensive operator and technician training program as described herein.

11. Provide as-built documentation, software, and any control logic and all associated support documentation on approved media which accurately represents the final system.

C. Control equipment.

D. Software.

1.2 RELATED SECTIONS

A. Section 23 74 13 - Packaged Rooftop Air Conditioning.

B. Section 23 54 00 - Furnaces.

C. Section 23 60 13 - Air Cooled Condensing Units

D. Section 23 05 93 - Testing and Balancing.

E. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

B. UL 916 - Underwriters Laboratories Standard for Energy Management Equipment

C. SBCCI - Southern Code Congress International

D. City, county, state, and federal regulations and codes in effect as of date of contract.

1.4 SYSTEM DESCRIPTION

A. General Requirements (BacNet)

1. A distributed logic control system complete with Direct Digital Control (DDC) and Direct Analog Control (DAC) software shall be provided. System shall be totally based on ANSI/ASHRAE Standard 135-1995, BACnet. This system is to control all mechanical equipment, including all unitary equipment such as VAV boxes, heat pumps, fan-coils, AC units, etc. and all air handlers, boilers, chillers, and any other listed equipment using native BACnet-compliant components.

2. The entire processing system shall be in complete compliance with the BACnet standard: ANSI/ASHRAE 135-1995. The system shall use BACnet protocols and LAN types throughout and exclusively. Non-BACnet-compliant or proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.

3. All logic controllers for terminal units, air handlers, central mechanical equipment, and Microsoft Windows-based operator's terminal(s) shall communicate and share data, utilizing only BACnet communication protocols.

4. All logic controllers shall be fully programmable. That is, programmable controllers for every terminal unit, air handler, all central plant equipment, and any other piece of controlled equipment shall be provided. Programming tools shall be provided as part of operator workstation for every controller supplied for the project.

B. General Requirements

1. Provide an engineered system of controls to accomplish the sequence of operations. This system is to control all specified equipment directly, without intervening conventional controls.

2. All Controllers for terminal units, air handlers, central mechanical equipment, and Windows based operators' terminal(s) shall communicate with each other and share information.

3. The controls contractor shall assume complete responsibility for the entire controls system as a single source and shall certify that he has on staff under his direct employ on a day to day basis, factory trained technical personnel, qualified to engineer, program, debug, and service all portions of the control system, including central system operators terminal, global controllers, terminal unit controllers, and all other portions of the control system.

C. Basic System Features:

1. Zone by zone control of space temperature, usage scheduling, optimum starting, equipment failure reporting, and override timers for off-hours usage. A zone is the area served by one HVAC unit .

2. Operator Terminal software shall be a Windows 98 or later application program. Software shall be multitasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Software shall completely support Windows 98 or Window NT Dynamic Data Exchange (DDE) interface. Software shall strictly follow Microsoft Windows API guidelines. Systems using proprietary software or Windows formats other than above are strictly prohibited. Operation of the terminal software shall be simple and intuitive.

3. Complete energy management firmware, including self adjusting optimum start, demand limiting, global control strategies and logging routines for use with total

control systems. All energy management firmware shall be resident in field hardware and not dependent on the Operators Terminal for operation. Operators terminal software is to be used for access to field based energy management control firmware only.

4. Priority password security systems to prevent unauthorized use. Each user shall have an individual password. Each user shall be assigned which control functions they have access to.

5. Equipment monitoring and alarm function including information for diagnosing equipment problems.

6. The complete system including, but not limited to terminal unit controllers, Global controllers and Operator terminals shall Auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in Global Controller memory shall be battery backed up for a minimum of 29 days. Unitary controllers shall utilize EEPROM for all variable data storage. Batteries on unitary controllers shall not be allowed.

7. Modular system design of proven reliability.

8. Each field panel capable of independent control.

9. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the Operators Terminal.

10. Equipment runtime totalization of fans, heaters, boilers, etc., capable of alarm generation and alarm dial out to remote sites.

11. Room sensors with digital readout that allow the user to view room temperature, view outside air temperature, adjust the room setpoint within preset limits and set desired override time. User shall also be able to shut unit off from sensor.

12. Field control devices such as terminal unit controllers shall have optically isolated communication lines. Controllers not optically isolated and utilizing a ground referenced communication technique are specifically prohibited.

13. Communication wiring for field control devices shall not be dependent on daisy chaining of communication wiring. Communication wire may be run in star patterns, daisy chained or combination of either, allowing units to be added to a communication line easily in the future.

14. All hardware and software shall be designed and manufactured by U.S. corporations. All hardware shall be U.L. listed with integral labels showing rating.

1.5 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:

1. Within four weeks after award of contract, the supplier shall submit review drawings, installation and operation instruction and a recommended spare parts list.

2. Drawings shall be standard sizes (8.5 inches x 11 inches) or (11 inches x 17 inches).

3. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.

4. List connected data points, including connected control unit and input device.

5. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.

6. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

7. Indicate description and sequence of operation of operating, user, and application software.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.

2. Include submittals data in final "Record Documents" form.

F. Operation and Maintenance Data:

1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.

2. Input/Output point and alarm point summary listing.

3. Electrical drawings showing all system internal and external connection points, terminal block layouts and terminal identification.

4. Manufacturer's instructions and drawings for installation, maintenance and operation of all purchased items.

5. Include keyboard illustrations and step-by-step procedures indexed for each operator function.

6. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

7. Overall system operation and maintenance instructions, including preventive maintenance and troubleshooting instructions.

8. Complete recommended spare parts list.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

H. Provide ten (10) copies of submittal drawings.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Responsibility: The supplier of the system shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by him.

C. Design system software under direct supervision of a Professional Engineer experienced in design of this Work and licensed at Design-Builder.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer with an office located within fifty (50) miles of constructions site.

F. Component Testing: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every controller, sensor, and all other components shall be individually tested by the manufacturer prior to shipment.

G. Tools, Testing and Calibration Equipment: Provide all tools, testing and calibration equipment necessary to ensure reliability and accuracy of the system.

H. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 PRE-CONSTRUCTION MEETING

A. Convene one week before starting work of this Section.

B. Require attendance of parties directly affecting the work of this Section.

1.8 WARRANTY

A. Warranty shall cover all costs for parts, labor, and associated travel, and expenses for a period of one year from completion of system demonstration.

B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the Vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

C. This warranty shall apply equally to both hardware and software.

D. Correct defective Work within a five year period after Substantial Completion.

E. Provide one year manufacturer's warranty for field programmable micro-processor based units.

F. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

1.9 PROTECTION OF SOFTWARE RIGHTS

A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:

1. Limiting use of software to equipment provided under these specifications.

2. Limiting copying.

3. Preserving confidentiality.

4. Prohibiting transfer to a third party.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Trane, Inc.

B. Substitutions: Not Permitted.

2.2 OPERATOR STATION

A. Work Station:

1. Configuration: IBM-compatible pentium based microcomputer system or better.

2. Minimum memory: 32 Mb RAM.

3. Memory clock speed: 450 MHz.

4. Display: Super video color graphics adapter (SVGA), 17 inch non-interlaced color monitor, maximum 0.28 mm dot pitch.

5. Floppy disk drive: 1.44Mb.

6. Hard disk drive: 1 Gb or larger.

7. Mouse: Software supported mouse with support software including self building menus and displays of system operations and functions.

8. Modem: Internal type modem or proprietary data modem with cables and communication interfaces required to provide the specified functions, minimum 56.6 kbps rate.

9. Printer: Support color printer. Equal to Hewlett Packard 930 Series.

10. Operating System: Windows 98.

B. Displays

1. Operator Terminal shall display all data associated with project as called out on drawings and/or point list supplied. System shall be capable of displaying graphic file, text and dynamic point data together on each display. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated every second without any action by the user. Terminal shall allow user to change all field resident EMS functions associated with the project such as set points, time schedules, holiday schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to point addresses or other numeric/mnemonic indications.

2. All displays shall be generated and customized in such a manner by the local system supplier that they fit the project as specified. Canned displays shall not be acceptable. Displays shall use Standard English (or specified language) for labeling and readout. Systems requiring factory programming for displays or logic are specifically prohibited. All displays and programming shall be supported locally by the installing contractor without factory dependency or

assistance.

3. Digital points shall be displayed as On/Off or with customized text. Text shall be justified Left, Right or Center as selected by the user. System must allow operator to change display assignment and also create new and original displays on line. System shall be supplied with a library of standard displays which may be used unaltered or be modified by the operator. Systems that do not allow customization or creation of new displays by the operator shall not be allowed.

4. Analog points shall be displayed with operator modifiable units. Analog Input points may also be displayed as individual objects on the display screen as an overlay to the system display. Analog Output points, when selected with the mouse, shall be displayed as a prompted dialog box. Selection for display type shall be individual for each point.

5. A Customized Menu Label shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu items may be mixed on the same display to allow sub displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A separate display security level may be assigned to each display and system point.

6. All dynamic point information shall be updated on the Operators terminal display once every 1 second. Any changes by the operator shall be acted on by devices in the field within 2 seconds maximum.

7. Displays may be modified on site or via remote communications.

8. System must have central controller to access system. System display to be at least 4 line X 20 character LED display.

9. Entire system shall operate without dependency on the central terminal.

C. Security System

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator terminal's functions unless user is logged on. This includes displays as outlined above.

2. Each Operators Terminal shall provide security for 20 users minimum. Each user shall have an individual password. Password shall be up to 4 alpha numeric characters, case sensitive. Each User shall be individually assigned which control functions and menu items the user has access to. All passwords, user names and access assignments shall be adjustable on-line, at the operators terminal. Each user shall also have a set security level that defines access to displays and also

defines what individual points the user can control.

D. Display of Scheduling Information

1. Display of Weekly schedules shall show all information in easy to read 7 day (week) format for each schedule. This includes all on/off times for each day along with all optimum start information.

2. Holiday schedules shall show all dates that are to be holidays. Holidays shall be shown on the terminal in a graphical calendar format showing all scheduled days for a given month. User shall be able to easily scroll through the months for each year for up to 20 years into the future as a minimum. Each day assigned as a holiday shall display as "All Off" or show "Scheduled" for that day.

3. Event schedules shall be shown in the same graphical calendar format and manner as Holiday schedules. Event schedules allow for scheduling of special events up to 20 years into the future. After event has elapsed, control returns to normal schedule.

4. Operator shall be able to change all information for a given Weekly, Holiday or Event schedule if logged on with the appropriate security access. This includes all information that has to do with optimum start including assignments such as sensors to use and heating/cooling factors.

E. Alarm Indication

1. System Terminal shall provide visual and printed means of alarm indication. Printout of alarms shall be sent to the assigned terminal and port.

2. Provide log of alarm messages. Alarm log shall be archived to the hard disk of the system terminal. Each entry shall include point descriptor and address, time and date of alarm occurrence, point value at time of alarm, time and date of point return to normal condition, time and date of alarm acknowledge.

3. Alarm messages shall be in plain English (or specified language) and shall be user definable on site or via remote communication. System shall provide a minimum of 20 user definable messages for each zone controlled.

F. Trend Log Information

1. System shall periodically gather samples of point data stored in the field equipment and archive the information on the Operator terminals hard disk. Archive files shall be appended with new sample data, allowing samples to be accumulated over several years. Systems that write over archived data shall not be allowed. Samples may be viewed at the operators terminal in a Trend Log. Trend log displays shall be in spreadsheet format. Provide capability for

operator to scroll through all trend log data. System shall automatically open archive files as needed to display archived data when operator scrolls through the data vertically. Display all trend log information in standard engineering units.

2. Operator shall be able to change trend log setup information as well. This includes information to be trend logged as well as interval at which information is to be logged. All points in the system may be logged. All operations shall be password protected.

3. Provide means for operator to export to a comma delimited file format all trend log data for use by other spread sheet programs. Operation of system shall not be affected by this operation. In other words, the system shall stay 100% on-line

G. Controller Status

1. Provide means for operator to view communication status of all controllers connected to the system. Display shall include controller, status and error count. Status will show if controller is communicating or not. Error count shall show actual count of communication errors between system and controllers in the field.

2. Provide means for operator to reset error count for all controllers to zero.

3. Provide capability to select alarm indication for each controller.

H. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include but not be limited to system time, day of the week, date of day light savings set forward setback, printer type and port addresses, modem port and speed, etc. Items shall be modified utilizing easy to understand terminology using simple mouse/cursor key movements.

2.3 GLOBAL CONTROLLER

A. General

1. Global controller shall provide battery backed real time clock functions. It shall also provide system communications to programmable and application specific controllers as noted in section 2.3 in the field. Global controller shall interface with Operator terminal(s) for information display. Global controllers shall share information in a Peer-to-Peer manner utilizing a high speed LAN communication network.

2. Global controller shall decide global strategies for system based on information from any points in the system regardless if the point is directly monitored by the controller. Program that implements these strategies shall be completely flexible

and user definable. Any system utilizing factory pre-programmed global strategies that cannot be modified by field personnel on site or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable. Program executed speed shall be once per second as a minimum.

3. Programming shall be object oriented using control program blocks. Provide documentation in flow chart form for all programming as part of the final system As-Built documentation. Include samples of flow chart documentation in submittals. All flow charts shall be generated with CAD system and automatically downloaded to controller. No reentry of data base shall be necessary.

4. Provide means to view inputs and outputs to each program block in real time as program is executing. This function may be done via the Operators Terminal, field computer, or via modem.

5. Controller shall have a minimum of 1 Mb battery backed Static RAM, expandable to 4 Mb, along with 256 Kb of EPROM. Battery shall retain static RAM memory and clock functions for a minimum of 30 days. Battery shall be a field replaceable lithium type. Battery shall automatically re-charge on resumption of local power.

6. Communication to field devices shall be via four individual two wire communication trunks. Communication baud rate of each trunk shall be 9600 baud. All field devices shall automatically search and detect the communication rate to match the Global controller. All field devices on the communication trunk shall be optically isolated. Ground referenced communications to field devices is prohibited. Routing of communication trunk may be daisy chained, run in star patterns or any other configuration that makes wiring easiest. Global controller shall be capable of communication to all field controllers that manufacturer has made in the past to allow backward compatibility.

7. Controller shall have at a minimum, one (1) additional communication ports in addition to the LAN port. The port shall be RS-232, one for communication to portable field computer and one for a modem for remote communications. The other two ports shall be RS-485 for connection to a permanent panel mounted display device (see section 2.4 for description), and for future connection to other devices.

B. Remote Communications

1. Provide all functions that will allow remote communications via modem to off-site locations. Include modem along with all cabling necessary for installation.

2. Global Controller shall have capability to call out alarm conditions automatically if desired. Alarm message and site description shall be sent to off site computer or serial printer. If desired, controller may also send encoded message to digital pager. All Global controllers connected to the local LAN shall be capable of calling out alarm messages through one shared modem connected to one or more of the Global controllers on the local LAN.

3. Controller shall have capability to call 20 different phone numbers each as a minimum. Numbers called may be controlled by type of alarm, time schedule, holiday schedule or other selectable program parameters.

4. Owner shall provide standard voice grade phone line for remote communication function.

5. Global controller and supplied modem shall be capable of modem-to-modem baud rates of 14.4K baud minimum over standard voice grade phone lines. Lower baud rates shall be selectable for areas where local phone company conditions require lower baud rates.

C. Schedules

1. Schedules shall be arranged in a three tiered hierarchy as follows:

   a. Highest level: Event Schedules

   b. Middle level: Holiday Schedules

   c. Lowest level: Weekly Schedules

2. Each Global Controller shall have at a minimum:

   a. 100 Weekly time schedules (7 day)

   b. 100 Holiday schedules (400 programmable days each)

   c. 20 Event schedules (400 programmable days each) with 8 schedule entries per day

3. Each schedule may be assigned to any point, controller, or program in the system.

4. Each schedule (Weekly, Holiday and Event) shall be capable of performing an optimum start. Optimum start calculation shall be based on outside air temperature, zone air temperature deviation from zones daytime heating and cooling set points, and individual zone adaptive heating and cooling coefficients that are adjusted each day based on performance parameters of the individual zone. Each schedule may use identical or individual sensors in its calculations.

5. Holiday schedule shall be provided to allow operation of system based on different schedule on specified holidays. Display of Holiday schedule shall be via a monthly calendar format. Operator shall be able to scroll through months and years.

6. Event schedules shall be identical to Holiday schedule format. However, event schedule shall be a one time action that once that time period is passed, the event schedule shall be erased for that particular day. Events may be scheduled up to one year in advance.

7. Operator may define and setup all schedule information from system terminal, via portable computer on site or via remote communications. This includes all times, dates and optimum start parameters. These functions shall be password protected.

D. Logging Capabilities

1. Each Global Controller shall log as a minimum 150 user selectable points with a minimum of 100 samples per point with standard memory configuration. Logging shall be expandable, user defined, with additional memory in global controller. Sample time interval shall be from 1 to 1000 seconds. Sample initiation may be by any of the following conditions:

   a. Selectable begin and end date and time

   b. Point COS (Any system point)

   c. Point Alarm Status (Any system point)

   d. Schedule ON status (Weekly, Holiday or Event schedules)

2. Any point in the system whether it is real or calculated may be logged.

3. Logs may be viewed both on site or off-site via remote communication.

4. Global controller shall periodically upload trended data to Operator terminal for long term archiving if desired.

E. Alarm Generation

1. Alarms may be generated for any condition of the system. This includes things such as analog point high/low alarm limits, digital point COS, communication failure to terminal unit controllers, etc. Controller shall have a minimum of 6 alarm types with 7 categories for each type.

2. Each alarm may be dialed out as noted above.

3. Provide alarm log for viewing of alarms. Log may be viewed on site at the system terminal or off-site via remote communications.

F. Demand Limiting

1. System shall be capable of monitoring energy demand. Energy demand may be from any type of energy source such as electrical or gas. Provide a Demand Limiting routine which shall shed assigned points or zones in the system to prevent the demand from exceeding preset limits. Demand limiting routine shall be a priority shed type allowing automatic override of zone or point shed when assigned temperature sensor exceeds operator set limits. Routine shall be able to change between 4 sets of demand limit and restore set points based on time of day or operator command.

2. Zone shed method shall be by either preventing operation of heating and cooling, or by shifting the zones heating and cooling set points.

3. All parameters of the Demand Limiting routine shall be modifiable from the Operators Terminal or via remote communications.

G. Energy Logging

1. Each global controller shall provide for a minimum of 10 Energy Logs. Each log shall monitor an energy meter and record or calculate the following information for each Day, Month and Year:

   a. Energy consumption

   b. Demand peak value and time of peak

   c. Outside air temperature minimum, maximum and average value

   d. Heating and Cooling degree day calculation

2. Energy meter input may be from any type of energy source such as electric, BTU or gas. Input type shall be dry contact pulse for electric or gas meters.

H. Field Interface/Display Terminal

1. Provide interface capability to display terminals. Interface shall support up to 8 field terminals on each global controller. Field Terminal(s) shall connect to the Global controller via a two conductor RS-485 cable in a star or tee tap configuration allowing easy addition of terminals in the future.

2. Field Terminals shall be capable of displaying and commanding any and all points in the system including those points on other global controllers utilizing customizable menus and data displays. Field Terminal data displays shall be

independent of Operator Terminal displays. Field Terminal operation shall not be dependent on Operator terminal operation. See section 2.4 for field terminal description.

I. Memory Modules

1. Global Controller data storage memory shall be modular, allowing additional memory to be added in the field (two modules minimum). Additional memory may be allocated by the operator to increase the storage capability of any or all routines requiring memory for storage of data. Modules shall be battery backed static RAM in Single In-line Modules (SIMM) or other easily insertable package.

2.4 CONTROL UNITS

A. General

1. Provide programmable and application specific Terminal Unit Controller as needed to comply with sequence of operation, point list and drawings. All Terminal Unit Controller units shall be completely stand-alone with no loss of control if communication with global controller is interrupted. All control parameters, programs and local variables such as setpoint information shall be stored in EEPROM on board each Terminal Unit Controller allowing the operator to change information as desired. Controllers that utilize a battery to backup control parameters, etc., shall not be allowed.

2. Programmable Terminal Unit Controllers shall be used in custom applications such as central plant, built up air handlers, fume hoods or when application specific controllers sequence of operation is not applicable.

3. Communication from Global controller to Terminal Unit Controllers shall be via two wire communication trunk as specified for Global Controllers above. Any type of Terminal Unit Controller shall communicate on the same communication trunk. System shall communicate to one Terminal Unit Controller regardless of whether other Terminal Unit Controllers on the same communication line are powered and connected. Ground referenced communications is prohibited.

4. Global controller shall communicate to all field controllers manufacturer has made in the past as well as currently.

B. Programmable Terminal Unit Controllers

1. Each programmable Terminal Unit Controller shall be completely programmable from the system terminal, via field computer or via remote communications. Program execution rate shall be ten times per second minimum (once every 100 milliseconds).

2. This controller shall be programmed to perform custom strategies for system based on information from all points in the field. Program that implements these strategies shall be completely flexible and user definable. Any controllers utilizing factory programmed strategies that cannot be modified by field personnel on site, require factory assistance, or cannot be downloaded via remote communications are not acceptable. Changing strategies via firmware changes is also unacceptable.

3. Programming shall be object oriented using program blocks familiar to control specialists for all program strategies. Provide documentation in flow chart form for all programming. Include samples of flow chart documentation in submittals. All flow charts shall be generated with CAD system and automatically downloaded to controller. No re-entry of data base shall be necessary. As-Built documentation of all software shall be provided to end user in flow chart form at completion of project.

4. Program and program parameters such as set points shall be stored in EEPROM. Battery backed RAM shall not be accepted for this level of controller.

5. All inputs shall be universal in that they accept analog and digital information. Inputs shall be capable of detecting a 0.1 second momentary closure. Analog inputs shall be capable of accepting thermistor inputs, 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA inputs. No external hardware shall need to be added for Terminal Unit Controller to accept these different types of inputs. All inputs shall utilize a minimum of 10 bit analog to digital conversion.

6. Every digital output shall have local status indication. Outputs shall have minimum control resolution of 0.1 seconds On or Off.

7. Each of the analog outputs shall be independently switch selectable to output 0 to 10 VDC or 4 to 20 mA. Unit shall be programmable to output a sub range of voltage or current to match the device controlled. Analog outputs shall use 8 bit digital to analog conversion.

8. Terminal Unit Controller may be programmed to control what is displayed on zone sensor display. See section 2.5. Terminal Unit Controller may be programmed to show alpha numeric values on zone sensor display in response to program changes or button presses on the zone sensor.

9. Each Terminal Unit Controller shall provide 24 VDC at 250 mA as a source of power for current transducer sensors in the field.

C. Application Specific Terminal Unit Controllers

1. Application Specific Terminal Unit Controllers shall be completely stand-alone controllers for unitary type controls such as VAV terminal boxes, heat pumps, AC units, unit ventilators, etc. All programs shall be resident in controller for complete stand-alone operation.

2. EEPROM technology shall be used for storage of program parameters such as set points, limits, etc., controllers utilizing a battery for backup of program parameters shall not be allowed.

3. All application specific Terminal Unit Controller units shall have capability to use Digital display zone sensor, or thermistor type zone sensor .

2.5 OPERATOR FIELD INTERFACE DEVICE

A. Hardware

1. Operator field interface shall communicate to global controller via RS-485 at 38.4K baud minimum. RS-232 port shall be available for reprogramming displays. This port shall be accessible without removing any covers from unit.

2. Provide minimum of 128K of nonvolatile RAM for display storage and 32K of EPROM. Battery shall retain memory for 30 days minimum.

3. Operator interface device shall be housed in plastic enclosure suitable for mounting in office area. Device shall be separate unit from global controller and mount on standard double wide box.

B. Displays

1. Operator Terminal shall display all data associated with project as called out on drawings and/or point list supplied. Information shall be labeled with English description on display and shall be shown in engineering units as labeled (i.e. temperature shall be displayed in degrees F, 72.3F.) Terminal shall allow user to change all EMS functions associated with the project such as set points, time schedules, holiday schedules, etc. with single button push. This shall be done without any reference to point addresses or other numeric/mnemonic indications.

2. All displays shall be generated and customized in such a manner by local system supplier that they fit the project as specified. No canned displays that are modifiable only by factory personnel shall be acceptable. Displays shall use Standard English for labeling and readout.

3. Menu system shall be used for display selection. Menu items on display shall allow penetration to lower level displays. Dynamic point information and menu items may be mixed on the same display to allow sub displays to exist for each item. Each display may be protected from viewing unless operator has

appropriate security level. Display security level may be assigned to each display.

4. All dynamic point information shall be updated every 1 second. Any changes by the operator shall be acted on by devices in the field within 1 second.

5. Cursor keys shall be used to move cursor to desired item for selection of new display or to allow the operator to make changes. Entry of name to view or change data shall not be necessary.

6. Displays may be modified on site or via remote communications.

C. Security System

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator terminal's functions unless user is logged on. This includes displays as outlined above.

2. Operator's Terminal shall access passwords from global controller that are user definable. Each password may have one of 10 security levels that define extent of access for operator once logged on with that password.

2.6 TEMPERATURE SENSORS

A. General

1. All temperature sensors to be solid state electronic, factory calibrated to within one-half degree F, totally interchangeable. Wall sensors to be housed in enclosure appropriate for application. Duct and well sensors to be electronically identical with housing appropriate for application. Provide appropriate wells for installation by others.

2. Provide Digital display zone sensors for all wall sensors as indicated on drawings.

B. Digital Display Zone Temperature Sensor

1. Sensor shall contain digital display and user function keys along with temperature sensor. Sensor shall function as occupant control unit. It shall allow occupant to raise and lower setpoint and activate terminal unit for night override use all within limits as programmed by building operator. Sensor shall also allow service technician access to terminal unit controller functions for use as system setup and test and service tool. Sensor shall display and allow modification of Terminal unit controller parameters such as VAV Minimum and Maximum CFM set points, Night heating and cooling set points, Minimum and Maximum setpoint limits. Systems that require a Hand held field service tool shall not be allowed.

2. Provide means for occupant to view room setpoint, room temperature and outside air temperature at each controller. Override time may be set and viewed in 0.1 hour increments. Override time count down shall be automatic, but may be reset to zero using function keys on unit. Display shall be blank in unoccupied mode unless a function button is pressed.

3. Display shall also be used for status and alarm indication as described in the sequence of operation.

2.7 OTHER SENSORS

A. Building Pressure Sensor:

1. Building pressure sensor shall be adjustable for both positive or negative area pressure and accurate to ± 5% of setting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Owners Representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

D. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to insure a complete operating system in accordance with the sequences of operation and point schedules.

C. The controls contractor shall furnish and install all control components and necessary hardware, computing equipment, and software as defined in this specification.

D. Control wiring and terminations for the building automation system shall be provided by the controls contractor. In addition, all 24 VAC electrical work specified herein shall be the responsibility of the controls contractor. The controls contractor must

accept responsibility for total system operation.

1. Wiring shall be installed in accordance with the requirements for low voltage controls as specified in the electrical specifications. Local codes shall have jurisdiction

E. All material and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project. All systems and components, except site-specific software, shall have previously been thoroughly tested and proved in actual use prior to installation on this project.

F. The system architecture shall be fully modular, permitting expansion of application software, system peripherals, and field hardware.

G. The system, upon completion of installation and prior to acceptance of the project, shall perform all operating functions as detailed in this specification.

H. Locate and install components for easy accessibility; in general, mount 60 inches above floor with minimum 3'-0" clear access space in front of units. Obtain Owner Representative's approval on locations prior to installation. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

I. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration and high temperatures.

J. Provide conduit and electrical wiring in accordance with Division 26. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

K. Identify all equipment and panels. Provide permanently mounted engraved tags to all panels.

3.3 INTERLOCKING AND CONTROL WIRING

A. Provide all 24 VAC interlock and control wiring. All wiring shall be installed in a neat and professional manner in accordance with Division 16 and all state and local electrical codes.

B. Provide all low voltage (24 VAC or below) wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions.

C. Low voltage control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control

equipment with the Owner's Representative prior to rough-in.

D. Low voltage communication wiring shall not be located within 6 feet of lighting ballast unless it is run inside conduit.

E. Provide auxiliary pilot duty relays on motor starters as required for control function.

F. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate all high voltage (120 VAC and above) with electrical contractor.

G. All control wiring installed in mechanical, electrical, telephone and boiler rooms to be installed in conduit or raceways provided and installed by the control contractor. All other wiring to be installed in a neat and inconspicuous manner per local code requirements.

3.4 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

C. Provide basic operator training for two (2) persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 24 hours dedicated instructor time. Provide training on site.

D. Provide the capability for off-site monitoring at Control Contractor's local and main office. At a minimum, off site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service.

E. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

B. Provide systems demonstration under provisions of Section 23 01 00.

C. Provide certificate stating that control system has been tested and adjusted for proper operation.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING AND SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Check valves.

G. Filter-driers.

H. Solenoid valves.

I. Expansion valves.

1.2 RELATED REQUIREMENTS

A. Section 22 07 19 - Piping Insulation.

B. Section 23 07 19 - HVAC Piping Insulation.

C. Section 23 54 00 - Furnaces.

D. Section 23 63 13 - Air Cooled Refrigerant Condensers.

E. Division 26 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.

C. AHRI 760 - Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2024).

F. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

I. ASME B31.9 - Building Services Piping; 2020.

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

L. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

2. If receiver is provided, install in liquid line leaving receiver.

3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

1. Use service valves on suction and discharge of compressors.

2. Use gage taps at compressor inlet and outlet.

3. Use gage taps at hot gas bypass regulators, inlet and outlet.

4. Use check valves on compressor discharge.

5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.

2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.

3. On steel piping systems, use strainer in suction line.

4. Use shut-off valve on each side of strainer.

G. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2. Use a filter-drier on suction line just ahead of compressor.

3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.

4. Use sealed filter-driers in low temperature systems.

5. Use sealed filter-driers in systems utilizing hermetic compressors.

6. Use replaceable core filter-driers in lines of 3/4 inch outside diameter or greater.

7. Use filter-driers for each solenoid valve.

H. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.

2. Use in liquid line of single or multiple evaporator systems.

3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

1.5 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Test Reports: Indicate results of leak test, acid test.

F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

B. Design piping system under direct supervision of a licensed hvac company experienced in design of this type of work and licensed in the state where the Project is located.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) .

C. Welders Certification: In accordance with ASME (BPV IX).

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.2 REGULATORY REQUIREMENTS

2.3 PIPING

A. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.

2. Joints: Flared.

B. Pipe Supports and Anchors:

1. Conform to ASME B31.5.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 REFRIGERANT

A. Refrigerant: As defined in ASHRAE Std 34.

1. R-410A.

2.5 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:

1. Henry Technologies.

2. Parker Hannifin/Refrigeration and Air Conditioning.

3. Sporlan Valve Company.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 460 psi.

2.6 VALVES

A. Manufacturers:

1. Hansen Technologies Corporation.

2. Henry Technologies.

3. Danfoss Automatic Controls.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Angle Valves:

1. Forged brass , forged brass seal caps with copper gasket, rising stem and seat , molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

D. Ball Valves:

1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 325 degrees F.

E. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.7 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

B. Straight Line, Non-Cleanable Type:

1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 500 psi.

2.8 CHECK VALVES

A. Manufacturers:

1. Hansen Technologies Corporation.

2. Parker Hannifin/Refrigeration and Air Conditioning.

3. Sporlan Valve Company.

4. Substitutions: See Section 01 60 00 - Product Requirements.

5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of

425 psi.

C. Straight Through Type:

1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 250 degrees F.

2.9 FILTER-DRIERS

A. Manufacturers:

1. Flow Controls Division Emerson Electric Co.

2. Parker Hannifin/Refrigeration and Air Conditioning.

3. Sporlan Valve Company.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Performance:

1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.

2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730 (I-P).

3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

4. Design Working Pressure: 500 psi, minimum.

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, and filtration to 40 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.

2. Sealed Type: Copper shell.

3. Connections: As specified for applicable pipe type.

2.10 SOLENOID VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric.

2. Parker Hannifin/Refrigeration and Air Conditioning.

3. Sporlan Valve Company.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Valve: AHRI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.

C. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

2.11 EXPANSION VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric.

2. Parker Hannifin/Refrigeration and Air Conditioning.

3. Sporlan Valve Company.

4. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, mechanical pressure limit (maximum operating pressure MOP feature), adjustable superheat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.

2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access to concealed valves and fittings.

K. Flood piping system with nitrogen when brazing.

L. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.

N. Insulate piping and equipment; refer to Section and Section 23 07 16.

O. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

P. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

Q. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

S. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

T. Fully charge completed system with refrigerant after testing.

U. Provide electrical connection to solenoid valves. Refer to Division 26.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using electronic leak detector. Test to no leakage.

3.4 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

END OF SECTION

SECTION 23 31 00

DUCTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Duct cleaning.

1.2 RELATED REQUIREMENTS

A. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

B. Section 23 33 00 - Duct Accessories.

C. Section 23 33 30 - Air Duct Sealants.

D. Section 23 37 00 - Air Outlets and Inlets.

E. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2015b.

D. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2015.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

I. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).; 2020.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

K. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

L. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

M. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

N. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

O. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

P. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

Q. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

R. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 DEFINITIONS

A. Duct Sizes: Duct sizes indicated on drawings are inside clear dimensions.

B. Low Pressure: Static pressure in duct less than 1" WG and velocities less than 2000 fpm (10 meters/second).

C. Medium Pressure: Static pressure between 1 and 6 inches WG and velocities between 1500 and 3000 fpm.

1.5 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide data for duct materials, duct liner, and duct connections.

C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

F. Confirm ductwork has been fabricated and installed in accordance with recommendations and SMACNA standards.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96, standards.

1.8 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

C. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 316.

D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

2. VOC Content: Not more than 250 g/L, excluding water.

3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.

4. For Use With Flexible Ducts: UL labeled.

5. Products:

   a. Seal all joints and seams on sheet metal supply, return, makeup air and exhaust ductwork with "Hardcast" type DT sealing tape and type FTA adhesive or "Hardcast" iron grip 601 duct sealant installed in strict accordance with manufacturer's instructions. Clean all dirt, oil, moisture, etc., before applying adhesive. Duct tape, UL listed or not, is not acceptable.

   b. Substitutions: See Section 23 01 00 - General HVAC Provisions.

E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Other Types: As required.

2.2 DUCT ASSEMBLIES

A. All Ducts: Galvanized steel, unless otherwise indicated.

B. Low Pressure Supply (Heating Systems): 1 inch w.g. pressure class, galvanized steel.

C. Return and Relief: 1 inch w.g. pressure class, galvanized steel.

D. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Provide air foil turning vanes when rectangular elbows must be used.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Fabricate continuously welded round duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

H. Lap metal duct in direction of air flow. Hammer down edges and slips to leave smooth duct interior.

I. Size round ducts installed in place of rectangular ducts from ASHRAE Table of Equivalent Rectangular and Round Ducts. No variation of duct configuration or sizes permitted except by written permission.

J. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.

1. Insulation: Fiberglass insulation with aluminized fiberglass scrim vapor barrier film.

2. Pressure Rating: 6 inches WG positive and 1.0 inches WG negative.

3. Maximum Velocity: 5000 fpm.

4. Temperature Range: -10 degrees F to 160 degrees F.

5. R-6.0 Formaldehyde free insulation.

6. UL -181 (UL listed).

7. Manufacturers:

    a. Hart & Cooley.

    b. Flex Master.

    c. Substitutions: See Section 23 01 00 - General HVAC Provisions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with draw bands.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

I. Use double nuts and lock washers on threaded rod supports.

J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

K. Connect flexible ducts to metal ducts per manufacturer's recommendations.

L. All round and rectangular duct installed in exposed areas shall be paint lock duct.

3.2 CLEANING

A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

B. If determined by the Architect and/or Engineer, that during construction the duct systems were not adequately protected and dirt/debris was allowed to enter the installed ductwork, then it will be required by the HVAC contractor for the duct system to be cleaned. If required, clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 23 33 00

DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Duct access doors.

D. Duct test holes.

E. Flexible duct connections.

F. Volume control dampers.

1.2 RELATED REQUIREMENTS

A. Section 23 31 00 - Ducts.

B. Division 26 - Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Project Record Drawings: Record actual locations of access doors, volume dampers, test holes, volume dampers, and volume dampers.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Fusible Links: Two of each type and size.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Krueger.
2. PCI Industries, Inc; Pottorff Brand.
3. Ruskin Company.
4. Titus.
5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with worm drive mechanism with removable key operator.

2.2 BACKDRAFT DAMPERS - METAL

A. Manufacturers:

1. Louvers & Dampers, Inc.
2. Nailor Industries Inc.
3. PCI Industries, Inc; Pottorff Brand.
4. Ruskin Company.
5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 DUCT ACCESS DOORS

A. Manufacturers:

1. Nailor Industries Inc.
2. Ruskin Company.
3. Greenheck Fan Corporation.
4. SEMCO Incorporated.
5. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.

a. Net Fabric Width: Approximately 3 inches wide.

2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.6 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc.

2. Nailor Industries Inc.

3. Ruskin Company.

4. Greenheck Fan Company.

5. Jer-Air Manufacturing.

6. United Enertech.

7. Substitutions: See Section 23 01 00 - General HVAC Provisions.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

1. Fabricate for duct sizes up to 6 x 30 inch.

2. Blade: 24 gage, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gage, minimum.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

F. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on minimum 2-inch stand-off mounting brackets, bases, or adapters.

3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.7 MISCELLANEOUS PRODUCTS

A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

1. Thickness: 2 mils.

2. High tack water based adhesive.

3. UV stable light blue color.

4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

END OF SECTION

SECTION 23 33 30

AIR DUCT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air duct sealants for permanently sealing fabricated joints and seams of HVAC air ducts and thermal insulation.

B. Reinforcing membrane for sealants.

1.2 RELATED SECTIONS

A. Section 23 07 13 - Duct Insulation.

B. Section 23 31 00 - HVAC Ducts and Casings.

C. Section 23 33 00 - Duct Accessories.

1.3 REFERENCES

A. ASTM D 1668 - Standard Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing; 1995.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

C. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

D. UL 181A - Closure Systems for Use with Rigid Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.

E. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 2005.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Manufacturer's product data, including physical properties and application instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Store materials in accordance with manufacturer's instructions. Protect from freezing.

1. Storage Temperature: 40 to 100 degrees F.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not apply below 35 degrees F. or above 120 degrees F.

B. Avoid high humidity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Hardcast, Inc.

2. RCD Corporation.

B. Substitutions: See Section 23 01 00 - General HVAC Provisions.

C. Supply all products specified in this section from a single manufacturer.

2.2 AIR DUCT SEALANTS

A. Low to High Velocity Air Duct Sealant: Non-toxic, water-based, fiber-reinforced adhesive-sealant; for permanently sealing fabricated joints and seams of sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, and thermal insulation; for repairing damaged and leaking air ducts; for sealing conditioned spaces from air infiltration.

1. Type: Elastomeric terpolymer emulsion.

2. Underwriters Laboratories Listed: UL 181A-M and UL 181B-M.

3. Solids by Weight: 67 percent, plus or minus 2 percent.

4. Weight per Gallon: 10.5 pounds, plus or minus 0.20 pounds.

5. Wet Film Coverage: 100 linear feet per gallon at 1/16 inch thick by 3 inches wide.

6. Consistency: Thixotropic, non-sagging.

7. Adhesive Cure: 72 hours at 50 percent humidity and 70 degrees F.

8. Service Temperature Limits: Minus 10 degrees to 180 degrees F.

9. Water Vapor Transmission Rate: 0.6157 perms in accordance with ASTM E 96.

10. Flame Spread Index: Not greater than 5, when tested in accordance with ASTM E 84.

11. Smoke Developed Index: Zero, when tested in accordance with ASTM E 84.

B. Low to High Velocity Air Duct Sealant: Hardcast Iron Grip 601 non-toxic, water-based, adhesive-sealant; for permanently sealing fabricated joints and seams of sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, and thermal insulation; for repairing damaged and leaking air ducts; for sealing conditioned spaces from air infiltration.

1. Type: Elastomeric terpolymer emulsion.

2. Underwriters Laboratories Listed: UL 181A-M and UL 181B-M.

3. Solids by Weight: 70 percent, plus or minus 2 percent.

4. Wet Film Coverage: 320 linear feet per gallon at 20 mil thick by 3 inches wide.

5. Consistency: Thixotropic, non-sagging.

6. Adhesive Cure: 48 hours at 50 percent humidity and 70 degrees F.

7. Flame Spread Index: Not greater than 5, when tested in accordance with UL-723.

8. Smoke Developed Index: Zero, when tested in accordance with UL-723.

C. Reinforcing Membrane: RCD "Glasscoat" inorganic woven fiberglass reinforcing membrane; conforming to irregular surfaces for sealing and coating thermal insulation, air ducts, return air plenums, equipment, vessels, pipes, and fittings.

1. ASTM D 1668, Type III.

2. Nominal Dry Weight: 1.2 to 2.0 ounces per square yard.

3. Saturated Weight: 1.6 to 2.6 ounces per square yard.

4. Nominal Thread Count: 10 by 20.

5. Breaking Strength, Saturated: 75 warp, 75 fill minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive air duct sealants.

B. Notify Architect of conditions that would adversely affect application of sealants. Do not proceed with application until unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Remove water, dirt, oil, grease, and corrosion from surfaces to receive air duct sealants.

3.3 APPLICATION

A. Apply air duct sealants in accordance with manufacturer's instructions.

B. Apply to sheet metal air ducts, UL 181 listed rigid fiberglass air ducts, UL 181 listed flexible air ducts, thermal insulation, and other surfaces where indicated.

C. Do not thin or mix.

D. Apply tack coat at rate of 2 gallons per 100 square feet.

E. Embed reinforcing membrane into tack coat.

F. Apply finish coat at rate of 2 gallons per 100 square feet.

G. Allow drying time as follows:

1. Minimum 6 hours when used outdoors if wet weather is imminent.

2. Minimum 24 hours before using air duct system.

3. Additional time as required by air temperature and humidity conditions.

END OF SECTION

SECTION 23 34 23

POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall exhausters.

B. Cabinet exhaust fans.

C. Ceiling exhaust fans.

1.2 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings.

B. Section 23 33 00 - Duct Accessories: Backdraft dampers.

C. Division 26 - Electrical: Equipment Wiring.

1.3 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2016.

B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

C. AMCA 261 - Directory of Products Licensed to Use the AMCA Certified Ratings Seal; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

F. NEMA MG 1 - Motors and Generators; 2021.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Equivalent fan selections shall not increase or decrease motor horsepower, increase top speed by more than 10%, or increase inlet air velocity by more than 20% from that specified.

C. Provide fans capable of accommodating static pressure variations of plus or minus 10%.

D. Provide balanced variable for motors 15 horsepower and under.

E. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.

F. Provide belt guards on belt driven fans.

G. Provide safety screen where inlet or outlet is exposed.

H. Prime coat fan wheels and housing factory inside and outside. Prime coating on aluminum parts is not required.

1.6 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acme.

B. Captive Aire.

C. Greenheck.

D. Loren Cook Company.

E. Twin Cities Blower.

F. Substitutions: See Section 23 01 00 - General HVAC Provisions.

2.2 POWER VENTILATORS - GENERAL

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

2.3 WALL EXHAUSTERS

A. Performance Ratings:

1. Refer to fan schedule on plan sheet for fan performance.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and solid state speed controller.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4 CEILING EXHAUST FANS

A. Performance Ratings:

1. Refer to fan schedule on plan sheet for fan performance.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and factory mounted solid state speed controller.

D. Grille: Molded white plastic.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide sheaves required for final air balance.

C. Install backdraft dampers on outlet to wall exhausters.

D. Provide backdraft dampers on outlet from ceiling exhauster fans and as indicated.

3.2 SCHEDULES

A. Drawing Code: See plan Schedule.

B. Air Flow Capacity: See plan Schedule.

C. Static Pressure: See plan Schedule.

D. Motor hp:

1. Electrical Characteristics: See plan Schedule.

E. Accessories:

1. See plan Schedule.

END OF SECTION

SECTION 23 36 06

AIR TERMINAL UNITS - VARIABLE VOLUME

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single duct terminal units.

1. Variable volume.

B. Integral heating coils.

1. Electric resistance.

1.2 PRODUCTS NOT FURNISHED AND NOT INSTALLED UNDER THIS SECTION

A. Section 23 09 24 - Direct Digital Controls System for HVAC: Thermostats, hot water valves, and DDC control components.

B. Division 26 - Electrical Specification.

1.3 RELATED SECTIONS

A. Section 23 31 00 - Ducts.

B. Section 23 33 00 - Duct Accessories.

C. Section 23 37 00 - Air Outlets and Inlets.

D. Section 23 09 24 - DDC Controls Systems.

E. Division 26 - Electrical Systems: Equipment Wiring Systems: Electrical supply to units.

1.4 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. UL 181 - Factory-Made Air Ducts and Connectors.

C. NFPA 70 - Electric Duct Heaters.

D. UL 1995, Heating and Cooling Equipment.

E. CUL C22.2 No. 236, Heating and Cooling Equipment.

F. ARI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals.

G. ASTM A 527 (Steel Sheet, Zinc Coated Galvanized).

H. A-A-1419 or F-F-310 Federal specification (filter element, Air conditioning, Viscous-impingement or Dry type, replaceable), Tested per UL 900.

1.5 SUBMITTALS

A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.

B. Submit product performance data indicating design air flow, minimum static pressure drop, fan operating condition.

C. Submit installation, operation and maintenance documentation.

D. Submit sound power and noise criteria (NC) values for radiated and discharge paths.

1.6 QUALIFICATIONS

A. Manufacturer: The company manufacturing the products specified in this section shall have a minimum of ten years experience producing products of this type.

1.7 SYSTEM RESPONSIBILITY

A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the listed acceptable manufacturers.

B. The duct system is computer designed for air balance and noise control using the performance data of the listed manufacturer. Substituting another VAV terminal unit manufacturer may require changes in the system design. These changes may include, but are not limited to, changes in ductwork size or layout, fittings, controls, building structure and piping.

1.8 WARRANTY

A. Provide manufacturer's parts warranty for one year from Date of Substantial Completion.

B. All warranties to begin at Date of Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers

1. Trane Inc.

2. Substitutions: Not Permitted.

B. Manufacturer shall participate in the ARI Certification program. Unit performance data shall be rated in accordance with ARI Standard 880. The manufacturer shall display the ARI Symbol on all units.

C. Single and dual duct terminal units shall be UL listed as an entire assembly.

2.2 MANUFACTURED UNITS

A. Single duct terminal units.

1. Ceiling mounted primary air control terminal units for connection to a single medium - 1.5-3.0 in. wg pressure duct of a central air distribution system. Terminals units may be provided with integral heating coils - see plans.

B. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory-set air flow, minimum factory-set air flow, and coil type.

2.3 FABRICATION

A. Casings: Units shall be completely factory-assembled, manufactured of corrosion protected steel, and fabricated with a minimum of 18-gauge metal on the high pressure (inlet) side of the terminal unit damper and 22-gauge metal on the low pressure (outlet) side and unit casing.

B. Plenum air filters shall be provided on all fan powered units.

C. Insulation Edge Treatment: All cut edges of insulation shall completely enclosed by metal to arrest cut fibers and prevent erosion into the airstream.

D. Assembly: Primary air control damper, airflow sensor, fans, and optional heating coil in single cabinet.

E. Rectangular Supply Air Outlet Connections: Rectangular outlet connections for single duct units shall be slip and drive type. Rectangular outlet connections for dual duct and fan powered units shall be flanged type.

2.4 PRIMARY AIR CONTROL DAMPER ASSEMBLY

A. Locate primary air control damper assembly inside unit casing. Construct the damper assembly from extruded aluminum and/or a minimum 20 gauge galvanized steel components. Maximum damper leak rate shall not exceed 1% of damper nominal CFM at 4 inch wg differential.

B. Provide damper assembly with integral flow sensor. Flow sensor shall be provided regardless of control type. Flow sensor shall be a multi-point, averaging, ring or cross type. Bar or single point sensing type is not acceptable.

2.5 ELECTRIC HEATING COIL

A. The electric heater is a factory-provided and installed, UL recognized resistance open-type heater. It also contains a disc-type automatic pilot duty thermal primary cutout, and manual reset load carrying thermal secondary device. Heater element material is nickel-chromium.The heater terminal box is provided with 7/8" (22 mm) knockouts for customer power supply. Terminal connections are plated steel with ceramic insulators. All fan-powered units with electric reheat are single-point power connections.

2.6 FAN ASSEMBLY

A. Fan assembly shall be forward curved centrifugal fan with direct drive permanently lubricated, permanent split-capacitor type, thermally protected motor. Motor must be capable of continuous operation under maximum fan load with no external static pressure. Provide unit with a SCR motor speed adjustment that is factory-installed and wired to the fan motor.

B. Fan motor horsepower shall not exceed the horsepower scheduled for each unit. Fan motors shall be high efficiency and shall not exceed those shown in the table below for each motor size.

1. Fan HP: 1/15 - 115 Volt/AMPS: 1.5; 277Volt/AMPS: 1.3.
2. Fan HP: 1/8 - 115 Volt/AMPS: 2.7; 277Volt/AMPS: 1.3.
3. Fan HP: 1/3 - 115 Volt/AMPS: 7.4; 277Volt/AMPS: 2.9
4. Fan HP: 1/2 - 115 Volt/AMPS: 11.4; 277Volt/AMPS: 4.4.

C. Internally suspend and isolate fan motor assembly from unit casing by using rubber isolators or torsion flex mounting legs.

D. Unit shall be equipped with a fan motor disconnect switch which breaks both legs of power entering the control box.

2.7 WIRING

A. Factory install and wire power line fusing, a disconnect switch and a 24 VAC transformer for control voltage (and power). Provide terminal strip in control box for field wiring of power source.

B. Factory install and wire all terminal unit fan controls. Install electrical components in control box with removable cover. Incorporate single point electrical connection to power source.

C. Disconnect Switch: Provide single and dual duct terminals with a factory installed and wired switch to disconnect power to the unit controls.

D. Power Line Fuse: Provide terminal units with integral power line fusing installed in the control box to prevent overcurrent damage to the unit controls.

E. Control Transformer: Provide terminal units with a factory installed and wired 24 VAC transformer to provide control voltage power to the unit.

2.8 DIRECT DIGITAL VAV CONTROLS

A. Direct Digital Controls

1. General. Direct digital controls (DDC) and factory costs to mount, calibrate and test the system shall be the responsibility of Section 23 09 24 DDC Controls Systems/Building Automation System (BAS) Contractor.

2. Multi-point, multi-axis flow ring or cross sensor to be furnished and mounted by terminal unit manufacturer. Single point or flow bar sensors are not acceptable. Flow sensing device shall be capable of maintaining airflow to within +/- 5 percent of rated unit airflow setpoint when installed with 1.5 duct diameters straight duct, of the same size as the primary airflow inlet, upstream from the unit.

B. Variable Air Volume (VAV) Terminal Unit Control

1. The VAV terminal units shall be individually controlled by a DDC VAV controller per VAV terminal unit. The DDC VAV controller, damper motor, and transducer shall be supplied and installed by the BAS contractor.

2.9 TESTING/VERIFICATION

A. Factory set and test all analog electronic controllers to within 5% of the scheduled maximum and minimum settings. Base performance on test in accordance with ARI880.

B. Maximum Casing Leakage: 1 percent of nominal air flow at 0.5 in wg inlet static pressure.

C. Maximum Damper Leakage: 1 percent of design air flow at 4 in wg inlet static pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation form 100 percent of design air flow to 25 percent nominal air flow for cooling units and 30 to 50 percent for units with heating coils.

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sqaure ceiling diffusers.

B. Registers/grilles.

1. Ceiling-mounted, exhaust and return register/grilles.

2. Wall-mounted, exhaust and return register/grilles.

3. Wall-mounted, grid core exhaust and return register/grilles.

C. Louvers:

1.2 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

1.3 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Air Devices, Inc.

B. Carnes Company HVAC.

C. Krueger.

D. Nailor.

E. Price Industries.

F. Ruskin.

G. Titus.

H. Tuttle-Bailey.

I. Substitutions: See Section 23 01 00 - General HVAC Provisions.

2.2 SQAURE CEILING DIFFUSERS

A. Type: Provide high performance 3-cone diffuser diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Frame: Surface mount, inverted T-Bar type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel or aluminum as indicated on drawings with baked enamel finish.

D. Color: As shown on drawings.

E. See Air Distribution Schedule on drawings for details and accessories.

2.3 CEILING RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 1/2 inch minimum depth, 1/2 inch maximum spacing, with blades set at 45 degrees, horizontal face.

B. Frame: Surface mount, inverted T-Bar type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel or aluminum as indicated on drawings with baked enamel finish.

D. Color: As shown on the drawings.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans, where indicated on plans.

F. See Air Distribution Schedule on drawings for details and accessories.

2.4 CEILING GRID CORE EXHAUST REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Aluminum with factory baked enamel finish.

C. Frame: Channel lay-in frame for suspended grid ceilings.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face, where indicated on plans.

E. See Air Distribution Schedule on drawings for details and accessories.

2.5 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 1/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As shown on the drawings.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face, where indicated on plans.

F. See Air Distribution Schedule on drawings for details and accessories.

2.6 LOUVERS

A. Type: 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/4 inch square mesh screen over exhaust and 1/4 inch square mesh screen over intake.

B. Color: As shown on the drawings.

C. Fabrication: 12 gage thick extruded aluminum, welded assembly, with finish as indicated on Air Distribution Schedule.

D. Mounting: Furnish with standard frame and extended sill for installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Provide minimum 6" deep plenum box on back of all return and exhaust grilles.

3.2 SCHEDULES

A. Air Outlet and Inlet Schedule

1. Drawing Code: Refer to plan schedule.

2. Manufacturer: As scheduled on drawings.

3. Model: As scheduled on drawings.

4. Description: As scheduled on drawings.

5. Finish: As scheduled on drawings.

6. Service: As scheduled on drawings.

7. Mounting: As scheduled on drawings.

8. Accessories: As scheduled on drawings.

END OF SECTION

SECTION 23 40 00

AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disposable, extended area panel filters.

1.2 RELATED REQUIREMENTS

A. Division 26 - Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 850 (I-P) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013 (Reaffirmed 2023).

B. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.[CHOICE TEXT]

C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

1.4 PERFORMANCE REQUIREMENTS

A. Conform to Section 7.4.

1. Dust Spot Efficiency: Plus or minus 5 percent.

1.5 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions and connection requirements.

C. Shop Drawings: Indicate filter assembly and filter frames, dimensions and connection requirements.

D. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

E. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Filters: One additional set of each type and size of disposable panel filters to be installed at the time the building is conveyed to the Owner.

1.6 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 FILTER MANUFACTURERS

A. American Filtration Inc.

B. AAF International/American Air Filter.

C. Camfil Farr Company.

D. Substitutions: See Section 23 01 00 - General HVAC Provisions.

2.2 DISPOSABLE, EXTENDED AREA PANEL FILTERS

A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton and synthetic fabric; supported and bonded to welded wire grid by corrugated aluminum separators.

1. Frame: Cardboard.

2. Nominal size: to match equipment filter size requirements.

3. Nominal thickness: 2 inches.

B. Rating, per ASHRAE Std 52.1:

1. Dust spot efficiency: MERV 8.

2. Initial resistance at 500 FPM face velocity: 0.30 inch WG.

3. Recommended final resistance: 0.9 inch WG.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

3.2 SCHEDULES

A. Air Filter Schedule

1. Refer to plan Equipment Schedule.

END OF SECTION

SECTION 23 51 23

BREECHINGS, CHIMNEY, AND STACKS FOR CONDENSING APPLIANCES

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Venting for the removal of products of combustion for Category II, III, IV gas burning appliances

1.2 REFERENCES

A. Underwriters Laboratories (UL):

1. UL1738

B. National Fire Protection Association (NFPA):

1. NFPA 54 - National Fuel Gas Code

1.3 QUALITY ASSURANCE

A. Comply with NFPA 54

B. Must install duct in accordance to manufacturer's listings and installation instructions.

C. Components coming in contact with the products of combustion shall carry the appropriate UL or cUL listing, mark or label.

1.4 WARRANTY

A. Condensing Appliance vent listed to UL1738 shall have a limited lifetime warranty to begin at the date of installation. Any portion of the vent repaired or replaced under warranty shall be warranted for the remainder of the original warranty period.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Metal Fab, Inc.

B. Substitutions: See Section 23 01 00 - General HVAC Provisions.

2.2 LISTED VENTING FOR CONDENSING APPLIANCES

A. The condensing appliance vent shall be double-wall for use with Category II natural draft appliances and Category III or IV positive pressure appliances.

B. Maximum temperature shall not exceed 550° F (288° C).

C. Vent shall be listed for an internal static pressure of 6" w.g. and tested to 15" w.g. for diameters 6-36 inches and 10" w.g. for diameters 3-5.

D. Vent shall be constructed of a material tested to UL1738, .015 thickness for 3"-12" diameters, .024 thickness for 14" to 24" diameters, and .035 thickness for 26" to 36" diameters.

E. Outer casing shall be constructed of aluminized steel of .018 thickness for 3"to 12" diameters, .024 thickness for 14" to 24" diameters, and .035 thickness for 26" to 36" diameters.

F. Condensing appliances may be vented with schedule 40 PVC if approved by equipment manufacturer.

PART 3-EXECUTION

3.1 STORAGE AND CONSTRUCTION

A. Protect materials from accidental damage.

B. All supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be included.

C. Joint assembly utilizes flanged mating surfaces with a factory supplied gaskets for diameters 6" through 24", for diameters 26" to 36" P070 sealant will be used on the flange surface. Flanges are joined with a vee band secured by tightening draw bolts. Diameters 3-5 inch utilize a snap-lock, gasketed connection.

D. Where exposed to weather, the outer closure band shall be sealed to prevent moisture from entering the space between the walls.

E. All parts exposed to the weather shall be protected by one (1) coat of corrosion and heat resistant base primer and one (1) coat of heat resistant paint unless constructed of 430, 304 or 316 stainless steel.

F. Vent shall terminate in accordance with installation instructions and local codes.

G. Installation shall conform to manufacturers installation instructions.

END OF SECTION

SECTION 23 54 00

FURNACES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Forced air furnaces.

B. Controls.

1.2 RELATED REQUIREMENTS

A. Section 23 01 00 - General HVAC Provisions.

B. Section 23 07 13 - Duct Insulation: Duct Liner.

C. Section 23 31 00 - Ducts.

D. Division 26 - Electrical.

1.3 REFERENCE STANDARDS

A. NFPA 54 - National Fuel Gas Code; 2024.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2024.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Project Record Documents: Record actual locations of components and connections.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 WARRANTY

A. Provide five year manufacturers warranty for solid state ignition modules.

B. Provide ten year manufacturers warranty for heat exchangers.

C. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Trane Inc.

B. Substitutions: Not Permitted.

2.2 GAS FIRED FURNACES

A. Annual Fuel Utilization Efficiency (AFUE): 0.96 ("condensing").

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.

1. Safety certified by CSA in accordance with ANSI Z 21.47.

2. Venting System: Direct.

3. Combustion: Sealed

4. Air Flow Configuration: Refer to drawings.

5. Heating: Natural gas fired.

6. Accessories:

    a. See schedule on drawings for required accessories.

C. Performance:

1. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

E. Primary Heat Exchanger:

1. Material: Hot-rolled steel

2. Shape: Tubular type.

F. Gas Burner:

1. Atmospheric type with adjustable combustion air supply,

2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.

3. Electronic pilot ignition, with hot surface igniter.

4. Non-corrosive combustion air blower with permanently lubricated motor.

G. Gas Burner Safety Controls:

1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.

2. Flame rollout switch: Installed on burner box and prevents operation.

3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

H. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.

I. Motor: 1750 rpm single speed, permanently lubricated, hinge mounted.

J. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.

K. Operating Controls

1. Room Thermostat: Cycles burner to maintain room temperature setting.

2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.

2.3 THERMOSTATS

A. Manufacturers:

1. Lennox Industries, Inc.

2. Substitutions: Not permitted.

B. Room Thermostat: Low voltage, electric solid state microcomputer based room thermostat with remote sensor:

1. System selector switch (heat-off) and fan control switch (auto-on).

2. Preferential rate control to minimize overshoot and deviation from setpoint.

3. Set-up for four separate temperatures per day.

4. Instant override of setpoint for continuous or timed period from one hour to 31 days.

5. Short cycle protection.

6. Programming based on every day of the week.

7. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

8. Battery replacement without program loss.

9. Thermostat display:

a. Time of day.

b. Actual room temperature.

c. Programmed temperature.

d. Programmed time.

e. Duration of timed override.

f. Day of week.

g. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and located correctly.

C. Verify that proper fuel supply and pressure are available for connection.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

B. Install furnace on insulated furnace stand.

C. Install in accordance with NFPA 90A.

D. Install gas fired furnaces in accordance with NFPA 54.

E. Provide vent connections in accordance with NFPA 211.

F. Pipe drain from humidifier to nearest drain.

G. Mount air cooled condenser on 4 inch thick concrete pad. Allow minimum 6 inches on all sides of equipment.

3.3 SCHEDULES

A. Furnaces:

1. See Schedule on drawings.

END OF SECTION

SECTION 23 55 24

GAS-FIRED RADIANT HEATERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gas-fired, tubular infrared radiant heaters.

1.3 SUBMITTALS

A. Product Data: For each type of gas-fired radiant heater indicated. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: For gas-fired radiant heaters. Include plans, elevations, sections, details, and attachments to other work.

1. Detailing fabrication and assembly of gas-fired radiant heaters, as well as procedures and diagrams.

2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

4. Wiring Diagrams: Power signal and control wiring.

C. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which equipment will be attached.

2. Items penetrating roof and the following:

a. Vent and gas piping rough-ins and connections.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For gas-fired radiant heaters to include in emergency, operation, and maintenance manuals.

F. Warranty: Documentation of one year on all internal components, five years on tube exchangers and ten years on burner from date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gas-fired radiant heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five year limited warranty on emitter tubes, ten years limited warranty on burner from Date of Substantial Completion.

2. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 TUBULAR INFRARED HEATERS

A. Acceptable Manufacturers:

1. Reznor/Thomas & Betts Corporation.

2. Re-Verber-Ray

3. Roberts-Gordon, Inc.

4. SunStar Heating Products, Inc.

5. Space-Ray.

6. Sterling HVAC Products; Div. of Mestek Technology Inc.

7. Superior Radiant.

B. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.20/CSA 2.34.

C. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.

D. Combustion Tubing: 4-inch- (100-mm-) diameter heat-treated aluminized aluminized steel steel with high-emissivity, high-temperature, corrosion-resistant external finish.

E. Tubing Connections: Heat-treated aluminized steel couplings or flared joints with stainless-steel draw bolts.

F. Reflector: Polished aluminum, 97.5" percent minimum reflectivity, with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above centerline of tubing. Provide for rotating reflector or heater around a horizontal axis for minimum 45-degree (0.52-radian) tilt from vertical.

1. Reflector Extension Shields: Same material as reflectors, arranged for fixed connection to lower reflector lip and rigid support to provide 100 percent cutoff of direct radiation from tubing at angles greater than 30 degrees (0.52 radians) from vertical.

2. Include hanger kit.

G. Burner Safety Controls:

1. Gas Control Valve: Two-stage, regulated redundant 24-V ac gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

2. Blocked Vent Safety: Differential pressure switch in burner safety circuit to stop burner operation with high discharge or suction pressure.

3. Control Panel Interlock: Stops burner if panel is open.

4. Indicator Lights: Burner-on indicator light.

H. Burner and Emitter Type: Gravity-vented or sidewall-vented power burner, with the following features:

1. Emitter Tube: 4-inch- (100-mm-) diameter, aluminized steel tubing with sight glass for burner and pilot flame observation.

2. Venting: Connector at exit end of emitter tubing for vent-pipe connection.

a. Vent Terminal: Vertical with approved vent cap.

3. Burner/Ignition: Power gas burner with hot surface and electronic flame safety.

4. Combustion-Air Connection: Duct connection for combustion air to be drawn directly from outdoors by burner fan. Provide approved combustion air intake cap.

2.2 CONTROLS

A. Thermostat: 2-stage, wall-mounting type with 50 to 90 degrees F (10 to 32 degrees C) operating range and fan on switch.

1. Control Transformer: Integrally mounted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired radiant heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

B. Suspended Units: Suspend from substrate using chain hanger kits and building attachments.

1. Restrain the unit to resist code-required horizontal acceleration.

C. Maintain manufacturers' recommended clearances to combustibles. Provide shielding where necessary to protect any combustibles.

3.2 CONNECTIONS

A. Piping installation requirements are specified in Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to gas-fired radiant heaters to allow service and maintenance.

C. Gas Piping: Comply with Section 22 10 05 Plumbing Piping. Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

D. Vent Connections: Comply with Section 23 51 00 Breechings, Chimneys, and Stacks.

E. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations,

including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

2. Verify bearing lubrication.

3. Verify proper motor rotation.

4. Test Reports: Prepare a written report to record the following:

a. Test procedures used.

b. Test results that comply with requirements.

c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

A. Obtain adjustment instructions from gas-fired radiant heater manufacturer before making any adjustments to burners or other heating components.

B. Adjust initial temperature set points.

C. Adjust burner and other unit components for optimum heating performance and efficiency.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired radiant heaters. Refer to Division 1 for demonstration and training.

END OF SECTION

SECTION 23 62 13

AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.2 RELATED REQUIREMENTS

A. Section 23 23 00 - Refrigerant Piping and Specialties.

B. Section 23 54 00 - Furnaces.

C. Section 23 82 16 - Air Coils.

D. Division 26 - Electrical: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 365 (I-P) - Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units; 2009.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).

D. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.

E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. Condenser:

1. Refer to plan Schedule.

B. Electrical Characteristics:

1. Refer to plan Schedule.

1.5 SUBMITTALS

A. Section 23 01 00 - General HVAC Provisions: Procedures for submittals.

B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Make submission with coils and air handling units with coils to ensure capacities are complementary.

C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

D. Design Data: Indicate pipe and equipment sizing.

E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

F. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.8 WARRANTY

A. Provide a five year warranty to include coverage for refrigerant compressors.

B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Trane Inc.

B. Substitutions: Not Permitted.

2.2 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, wind deflector, and screens.

B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.

C. Construction and Ratings: In accordance with ARI 210/240, ARI 365, and UL 207. Testing shall be in accordance with ASHRAE Std 23.

D. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1.

2.3 CASING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels with quick fasteners and piano hinges.

2.4 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

B. Coil Guard: Hail Guard.

2.5 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in current and thermal overload protection.

C. Horizontal discharge, double width, double inlet forward curved centrifugal type condenser fans, equipped with roller or ball bearings with grease fittings extended to outside of casing, V-belt drive with belt guard.

2.6 COMPRESSORS

A. Compressor: Hermetic reciprocating type or hermetic scroll type.

B. Mounting: Statically and dynamically balance rotating parts and mount on rubber-in-shear vibration isolators. Internally isolate hermetic units on springs.

C. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Furnish with starter.

2.7 REFRIGERANT CIRCUIT

A. Provide each unit with one refrigerant circuit or two independent refrigerant circuits, factory supplied and piped. Refer to Section 23 23 00.

B. For each refrigerant circuit, provide:

1. Filter dryer replaceable core type.
2. Liquid line sight glass and moisture indicator.
3. Thermal expansion valve for maximum operating pressure.
4. Insulated suction line.
5. Suction and liquid line service valves and gage ports.
6. Liquid line solenoid valve.
7. Charging valve.
8. Discharge line check valve.

9. Compressor discharge service valve.

10. Condenser pressure relief valve.

2.8 CONTROLS

A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection. Factory mount disconnect switch on unit under provisions of Section 26 05 83.

B. For each compressor, provide across-the-line or part winding starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.

C. Provide safety controls arranged so any one will shut down machine:

1. High discharge pressure switch (manual reset) for each compressor.

2. Low suction pressure switch (manual reset) for each compressor.

3. Oil Pressure switch (manual reset).

D. Provide the following operating controls:

1. Five minute off timer prevents compressor from short cycling.

2. Low ambient temperature controls.

3. Hot gas bypass sized for minimum compressor loading on one compressor only, bypasses hot refrigerant gas to evaporator.

4. Low ambient thermostat to lock out compressor at low ambient temperatures.

E. Provide controls to permit operation down to 0 degrees F ambient temperature.

1. Thermostat to cycle fan motors in response to outdoor ambient temperature.

2. Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.

3. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.

4. Electronic control consisting of mixing damper assembly, controlled to maintain constant refrigerant condensing pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

C. Provide for connection to electrical service.

D. Install units on concrete base as indicated.

E. Install units on roof curbs as indicated.

F. Provide connection to refrigeration piping system and evaporators. Refer to Section 23 23 00. Comply with ASHRAE Std 15.

3.2 SYSTEM STARTUP

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

D. Provide cooling season start-up, and winter season shut-down for first year of operation.

3.3 SCHEDULES

A. Air Cooled Condensing Units

1. As scheduled on drawings.

END OF SECTION

SECTION 23 74 13

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 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.

1.2 RELATED SECTIONS

A. Section 23 07 13 - Duct Insulation.

B. Section 23 40 00 - Air Cleaning Devices.

C. Section 23 09 23 - DDC Controls Systems.

D. Division 26 - Electrical: Equipment Wiring Systems.

1.3 REFERENCES

A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. AHRI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard.

D. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment.

E. ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

F. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

G. 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.

H. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment.

I. AHRI 270 - Sound Rating of Outdoor Unitary Equipment.

J. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment

K. ANSI/NFPA 70-1995 - National Electric Code.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions for submittal requirements.

B. Submit unit performance data including: capacity, nominal and operating performance.

C. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

D. 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.

E. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

F. 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.

1.5 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.

1.6 WARRANTY

A. Provide parts warranty (excluding refrigerant) for one year from Date of Substantial Completion as accepted by the Owner.

B. Provide five-year extended warranty for compressors.

C. Provide five-year heat exchanger limited warranty.

D. All warranties shall begin at Date of Substantial Completion as accepted by the Owner.

1.7 EXTRA MATERIALS

A. Provide one set of filters.

B. Furnish a complete set of fan motor drive belts.

PART 2 PRODUCTS

2.1 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. Trane.

2. Substitutions: Not Permitted.

2.2 GENERAL UNIT DESCRIPTION

A. Units furnished and installed shall be Gas/Electric packaged rooftops as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on AHRI Standard .. Units shall consist of insulated weather-tight casing with compressors, air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls factory mounted, wired, and tested.

B. Unit(s) shall be 100% factory run tested and fully charged with R-410A at the factory

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.

2.3 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.

2.4 AIR FILTERS

A. Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. Two-inch thick pleated media MERV 8 filters shall be provided.

2.5 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 belt driven, supply fans with adjustable motor sheaves.

D. Outdoor and Indoor Fan High efficiency ODP motors shall be permanently lubricated and have internal thermal overload protection.

E. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

F. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

2.6 GAS FIRED HEATING SECTION

A. Completely assembled and factory installed heating system shall be integral to unit, UL or CSA approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping through base or side - see schedule for thru the base requirements..

B. Heating section shall be factory run tested prior to shipment.

C. Induced draft combustion type with direct spark ignition system, redundant main gas valve, and 2-staged heat.

D. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Provide flame rollout switches.

E. Induced draft blower shall have combustion air proving switches and built-in thermal overload protection on fan motor.

F. Heat Exchanger: Stainless Steel heat exchanger.

G. Burners: Burners shall be of the in-shot type constructed of stainless steel.

H. Limit controls: High temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow or loss of indoor airflow.

2.7 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 factory installed thermal expansion valve (TXV) for each refrigerant circuit. Factory pressure tested at 450 psig and leak tested at 200 psig.

D. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

E. Provide factory installed and wired drain pan condensate overflow switch - switch shall shut the unit down in the event that a clogged condensate drain line prevents proper condensate removal from the unit. Devices installed in the drain line shall not be permitted.

2.8 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.

2.9 REFRIGERATION SYSTEM

A. Compressor(s): Provide scroll compressor with direct drive operating at 3600 rpm. Integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads.

B. Units shall have cooling capabilities down to 0 degree F as standard via microprocessor controls. For field-installed low ambient accessory, the manufacturer shall provide a factory-authorized service technician that will assure proper installation and operation.

C. Provide each unit with one (6 tons and below) or two (7.5 tons and greater) refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

D. Provide hot gas reheat coil with factory built-in dehumidification sequence, where required on the schedule. Provide wall mounted humidity sensor. Option is required with factory TXV, evaporator defrost control (HGBP not optional).

2.10 EXHAUST/RETURN SECTION

A. Provide, on downflow units with a factory supplied field installed power exhaust assembly (where indicated on schedule) that shall assist the barometric relief damper in the economizer in relieving building pressurization.

2.11 OUTDOOR AIR SECTION

A. Provide a fully integrated Enthalpy controlled 100% modulating outside air economizer with unit return and barometric relief air dampers, minimum position setting, preset linkage, wiring harness with plug. Unit operation is through primary temperature controls that automatically modulate dampers to maintain space temperature conditions.

B. Provide economizer with Comparative Enthalpy Control.

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.

2.12 OPERATING CONTROLS

A. Provide microprocessor unit-mounted DDC control which when used with an electronic zone sensor provides proportional integral room control. This UCM shall perform all unit functions by making all heating, cooling, and ventilating decisions through resident software logic.

B. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.

C. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.

D. Economizer Preferred Cooling (if supplied with economizer) - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

2.13 STAGING CONTROLS

A. Provide NEC Class II, electronic, adjustable zone control to maintain zone temperature setting

B. 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.

3. Zone sensor for CO2.

4. Zone sensor for humdity.

C. Provide remote temperature sensor capability.

D. Provide mixed air sensor in supply air to close outside air damper.

2.14 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

3.1 EXAMINATION

A. Contractor shall verify that roof is ready to receive work and opening dimensions are as per manufacturer's recommendations.

B. Contractor shall verify that proper power supply is available.

3.2 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.

3.3 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 82 16

AIR COILS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerant coils.

1.2 RELATED REQUIREMENTS

A. Section 23 23 00 - Refrigerant Piping and Specialties.

B. Section 23 31 00 - Ducts: Installation of duct coils.

C. Division 26 - Electrical. Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 SUBMITTALS

A. See Section 23 01 00 - General HVAC Provisions.

B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

D. Certificates: Certify that coils are tested and rated in accordance with ARI 410.

E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.7 WARRANTY

A. Provide five year manufacturer warranty for coils.

B. All warranties to begin at Date of Substantial Completion as accepted by the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Same as equipment supplier.

B. Substitutions: Not Permitted.

2.2 REFRIGERANT COILS

A. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

B. Fins: Aluminum or copper continuous plate type with full fin collars. Solder coat copper fin coils.

C. Casing: Die formed channel frame of 16 gage galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

D. Headers: Seamless copper or brass tubes with silver brazed joints.

E. Liquid Distributors: Brass or copper venturi type distributor with seamless copper distributor tubes, 5/16 inch outside diameter; maximum 12 circuits per distributor.

F. Testing: Air test under water at 300 psi for working pressure of 250 psi; clean, dehydrate, and seal with dry nitrogen charge.

G. Configuration: Down feed with bottom suction to prevent trapping of oil.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers written instructions.

B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.

2. Provide frames for maximum three coil sections.

3. Arrange supports to avoid piercing drain pans.

4. Provide airtight seal between coil and duct or casing.

5. Refer to Section 23 31 00.

C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

D. Install coils level. Install cleanable tube coils with 1:50 pitch.

E. Make connections to coils with unions and flanges.

F. Refrigerant Coils: Provide sight glass in liquid line within 12 inches of coil. Refer to Section 23 23 00.

G. Insulate headers located outside air flow as specified for piping. Refer to Section 23 07 19.

3.2 SCHEDULES

A. Heating and Cooling Coils: Same as equipment manufacturer.

END OF SECTION

SECTION 26 00 10

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Specifications and drawings are complimentary except that, in case of conflict, the most stringent will govern.

B. Judgment shall be exercised to install electrical work in a practical manner to function properly, simplify future maintenance, and to fit building construction and finish. Items not shown or specified which are required to produce a complete, operative and finished system shall be provided.

C. The electrical plans are a guide to the Contractor to show general arrangement of conduit and wiring and equipment required. If any error omissions or obscurities appear therein, which are questionable, do not conform to good practice, or appear contrary to the purpose and intent of the work, the Contractor shall promptly notify the Architect and Engineer and apply for directions before construction. The exact location of conduit runs and lengths shall be determined by the Contractor in the field.

D. The drawings may be superseded by later revised or detailed drawings or specification addenda prepared by the Architect. The Contractor shall conform to all reasonable change without extra cost to the Owner. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation, shall be included.

E. Examine the premises in accordance with Division 1 and Division 2 of the specifications.

F. The Owner may furnish some equipment. Electrical Contractor is responsible to check the drawings and specifications for equipment that will be furnished by the Owner. Furnish the electrical connections, etc., on all Owner furnished equipment.

G. Should the particular equipment which any bidder proposes to install, require other space conditions than those indicated on the drawings, arrange for such space with the Engineer before submitting a bid. Should changes become necessary because of failure to comply with this clause, install the changes without additional expense.

H. Where electrical equipment is installed that causes electrical noise interference with other electrical systems installed under this contract, equip the offending equipment with isolating transformers, filters, shielding or any other means as required for the

satisfactory suppression of the interference as determined by the Engineer.

I. Comply with National Electric Code, NFPA, appropriate Building Code, and all local, state, and national ordinances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The General Conditions and Supplementary General Conditions of the contract are an integral part of Division 26 of the Specifications. Carefully note its contents in performance of the work.

B. The General Requirements as included in Division 1 of the Specifications are an integral part of Division 26. Carefully note its contents in performance of the work.

C. Examine all of the contract drawings and specifications, field verify existing conditions, or otherwise determine the extent of related work in other divisions before submitting a quotation for the work in this division. Coordinate the work in this division with work in other divisions through the Electrical Contractor. No extra payment will be made for additional work required by failure to coordinate the work. Should drastic changes from original drawings be necessary, the Contractor shall notify the Architect and secure written approval and agreement from the Architect on necessary adjustments.

D. The architectural, mechanical and structural plans and specifications, including Information to Bidders and other pertinent documents issued by the Architect or Engineer are a part of this Specification and the accompanying electrical plans. Comply with them in every respect. Examine all the above carefully.

1. Failure to comply does not relieve the Contractor of responsibility nor may it be used as a basis for additional compensation due to omission of architectural, mechanical and structural details from the electrical drawings.

E. Related work in other divisions requiring cooperation and coordination with this division includes, but is not limited to, the following:

1. Power arranged under Division 1.

2. Perform all cutting and patching as required under Division 1.

3. Furnish all sleeves, inserts, anchors and supports required by this work to be installed in concrete or masonry and coordinate with the respective trades under Division 3 and 4 for proper locations and installation.

4. Flash and seal roof penetrations in accordance with Division 7. Furnish locations and sizes and coordinate the installation with the respective trade.

5. Perform painting of electrical equipment and materials in finished areas as required under Division 9. Touch up or prime any surfaces required in this division in accordance with Division 9. Provide factory finishes as specified in other sections of this division.

6. Install branch circuits and make final connections to any equipment requiring electric power that is furnished and installed by the Contractor or by the Owner. Perform the electrical work according to approved shop drawings.

7. Install empty raceways and outlet boxes or branch circuits for equipment to be furnished by others and installed after completion of the contract.

8. Install and connect motor starters furnished under Division 23 where starters are not an integral part of the equipment. Insure that starters generally conform to the requirements of this division.

9. 120 volt control wiring is furnished and installed by the Electrical Contractor in accordance with the requirements of Division 23.

10. Mechanical equipment control conduit system furnished and installed by the Mechanical Contractor.

11. Motors are furnished and installed generally as an integral part of equipment specified under Division 23 and must conform to the requirements of this division.

1.3 FEES, PERMITS AND INSPECTIONS

A. Obtain any and all required permits in connection with this work under the Contract and pay any and all fees in connection therewith to include fees by the utility companies.

B. Under this section of work the Contractor shall, upon completion of the work, furnish a certificate of final inspection to the Architect from the inspection department having jurisdiction.

1.4 CODES AND STANDARDS

A. All work shall be done in a good workmanlike manner. Materials and workmanship shall comply with all applicable local state and federal codes including, but not limited to, the following:

1. National Electrical Code, Latest Edition (NEC).

2. Underwriters' Laboratories, Inc. (UL).

3. Institute of Electrical and Electronic Engineers (IEEE).

4. Insulated Power Cable Engineers' Association (IPCEA).

5. National Electrical Manufacturers' Association (NEMA).

6. American Standards Association (ASA).

7. American Society for Testing Materials (ASTM).

8. State Fire Prevention Code.

9. Occupational Safety and Health Act (OSHA).

10. National Fire Protection Association (NFPA).

11. International Building Code (IBC).

B. Comply with all State and Federal ADA Accessible Guidelines in regard to accessible or handicapped features.

C. The latest specifications and standards available shall be used for the above.

D. In case of discrepancy between the applicable codes, plans and specifications, the most stringent shall govern.

E. Should the Contractor perform any work that does not comply with requirements of the applicable authorities, he shall bear all cost arising in correcting the deficiencies.

F. Equipment and materials which are not covered by UL standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory.

1.5 DEMOLITION

A. Coordinate all demolition with the General Contractor. All existing wiring is to be removed as necessary. Reuse existing circuits for relocated devices and light fixtures.

PART 2 PRODUCTS

2.1 QUALIFICATION (PRODUCTS AND SERVICES)

A. Approvals are required of products or services of proposed manufacturers, suppliers and installers and will be based upon submission by Contractor of certification.

B. Manufacturer's Qualifications, provide submittal information with the following: Manufacturer regularly and presently manufactures as one of the manufacturer's principal products the following items and has manufactured these items for at least five (5) years.

1. Wire and Cable - all types.
2. Light Fixtures.
3. Lighting Switches and Receptacles.
4. Dimmers.
5. Molded Case Circuit Breakers.
6. Fuses.
7. Conduit.
8. Wiring Devices.
9. Low Voltage Fusible and Non-Fusible Switches.
10. Fire Alarm Systems and Equipment.
11. Conduit Supports and Fittings.
12. Panelboards.
13. Transformers.
14. Fire Sealant.

C. Manufacturer's product submitted must have been in satisfactory operation on three (3) installations similar to this project for approximately five (5) years.

D. There must be a permanent service organization maintained or trained by manufacturer which will render satisfactory service to this installation within eight (8) hours of receipt of notification that service is needed.

E. Installer must have the technical qualifications, experiences, trained personnel and facilities to install specified items including at least three (3) years of successful installation of electrical work similar to that required on this project. Approval will not be given where the experience record is one of unsatisfactory performance.

F. The lighting wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time lighting designer as well as personnel who are available to service the project after completion.

2.2 MANUFACTURED PRODUCTS

A. Insure that materials and equipment furnished is of current production by manufacturers regularly engaged in the manufacture of such items for which replacement parts should be available.

1. Items not meeting this requirement but which otherwise meet technical specifications and merits of which can be established through reliable test reports or physical examination of representative samples will be considered.

B. Provide products of a single manufacturer when more than one (1) unit of the same product is needed.

C. Equipment Assemblies and Components:

1. All components of an assembled unit need not be products of the same manufacturer.

2. Manufacturers of equipment assemblies which include components made by others must assume complete responsibility for the final assembled unit.

3. Components must be compatible with each other and with the total assembly for the intended service.

4. Constituent parts which are similar must be the product of a single manufacturer.

5. Moving parts of any element of equipment of the units normally requiring lubrication must have means provided for such lubrication and must be adequately lubricated at factory prior to delivery.

D. Identify all factory wiring on the equipment being furnished and on all wiring diagrams.

E. Equipment and materials shall be new and shall bear the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material.

F. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.

G. Dimensions: It shall be the responsibility of the Contractor to insure that items furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications. Dimensions are to be taken from the architectural drawings.

H. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of equipment and materials. Notify the Architect of any conflict between any requirement of the contract documents and the manufacturer's directions and obtain the Architect's written instruction before preceding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Architect, he shall bear all costs arising in correcting the deficiencies.

I. The Contractor shall provide and install all accessories, and incidental items to complete the work, ready to use and fully operational.

2.3 EQUIPMENT RATINGS AND APPROVAL OF "EQUAL" EQUIPMENT

A. Equipment voltage ratings must be in accordance with the requirements indicated on the drawings or as specified.

B. Obtain written approval for any equipment which differs from the requirements of the drawings and specifications.

1. Furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required.

2. Approval by the Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost.

3. Furnish and install any other items required for the satisfactory installation of the equal equipment at no additional cost. This includes, but is not limited to, changes in branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels, and correlation with other work, subject to the jurisdiction and approval of the Engineer.

C. Equipment and materials specified herein are named to establish a standard of quality. Other material of equal quality may be substituted per Section 01 60 00 and with approval by the Architect.

D. It is the responsibility of the Contractor to investigate any desired substitutions for specified equipment prior to submission of his bid. The contractor shall be responsible for any changes required in mechanical, electrical or structural systems resulting from equipment substitutions and shall bear all costs for those changes whether the substitute equipment is named by Architect for "equal" consideration or not. All changes shall be accomplished in a manner acceptable to the Architect at no additional cost to the Owner.

E. In order to obtain prior approval on equipment or material not specified in Division 26, 27 and 28 Specifications or Equipment Schedules, Contractor MUST submit to the Engineer any proposed equipment or material ten (10) working days prior to the bid date.

2.4 EQUIPMENT PROTECTION

A. Store all materials and equipment to be installed in the work so as to insure the preservation of their quality, workability, and fitness for the work intended. Provide storage provisions for protection from the elements, rust and physical damage. Place stored materials on clean, hard surfaces above ground and keep covered at all times to insure protection from paint, plaster, dust, water and other construction debris or operations. Install heaters under the protective cover where the equipment may be damaged due to moisture and weather conditions. Keep conduit ends plugged or capped and all covers closed on boxes, panels, switches, fixtures, etc., until installation of each item. Store all plastic conduit or duct out of direct sunlight in shaded areas. Located stored materials and equipment to facilitate prompt inspection. All boxes and packaging must remain intact.

B. Protect during installation, all equipment, controls, controllers, circuit protective devices, etc., against entry of foreign matter on the inside and be vacuum clean both inside and outside before testing, operating and painting.

C. Replace damaged equipment, as determined by the Engineer, in first class operating condition or return to source of supply for repair or replacement.

D. Protect painted surfaces with removable heavy Kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

E. Repair damaged paint on equipment and materials. Finish with same quality of paint and workmanship as used by manufacturer so repaired areas are not obvious.

F. All lighting fixtures are to be stored on the project in their original factory cartons.

2.5 EQUIPMENT ACCESSORIES

A. Furnish and install all equipment, accessories, connections and incidental items necessary to fully complete all work, ready for use, occupancy and operation by the Owner.

B. Where equipment requiring different arrangement or connections from those shown is provided, install the equipment to operate properly and in harmony with the intent of the drawings and specifications.

C. Support, plumb, rigid and true to line all work and equipment included. Study thoroughly all general, structural, electrical and mechanical drawings, shop drawings

and catalog data to determine how equipment is to be supported, mounted or suspended and provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper supports whether or not shown on the drawings. When directed, submit drawings showing supports.

PART 3 EXECUTION

3.1 WORK PERFORMANCE

A. Furnish and install a temporary electrical distribution system of adequate feeder sizes to prevent excessive voltage drop. Install all temporary work in a neat and safe manner. Provide temporary lighting as necessary to furnish 2.5 footcandles on all work surfaces.

B. Field coordinate with other trades in ample time to build all chases and openings, set all sleeves, inserts and concealed materials, and provide clearances that may be required to accommodate materials and equipment. Lay out electrical work so that in case of interference with other items the layout may be altered to suit conditions encountered.

C. Cutting and Patching:

1. The Electrical Contractor shall be responsible for all required cutting, patching, etc., incidental to this work and shall make all required repairs thereafter to the satisfaction of the Engineer. Do not cut into any structural element, beam or column without the written approval of the Engineer.

2. Pipes, conduits, cables, wires, wire ducts and similar equipment that pass through fire or smoke barriers shall be protected in accordance with NFPA 101.

D. Wall Penetrations: When conduit, wireways, bus duct and other electrical raceways pass through fire partitions, fire walls, or walls and floors, install a firestop that provides an effective barrier against the spread of fire, smoke and gases. Firestop material must be packed tight and completely fill clearances between raceways and openings. Use firestop material conforming to the following:

1. All wall penetrations shall be caulked and sealed. Provide fire barrier pillows to protect the interior of conduits/sleeves passing through fire rated walls.

2. The Contractor shall furnish and install all necessary sleeves and chases for all work passing through and attaching to walls, ceilings or the roof.

3. Provide UL listed, fire rated poke through devices for floor penetrations as required by the Standard Building Code, National Fire Code and Life Safety Code.

4. Provide UL approved fire rated chases and fire sealing as required to maintain fire rating for all penetrations in fire rated walls.

5. Firestopping material must be of the latest type as supplied by leading manufacturers such as "3M".

6. Floor, exterior wall and roof seals must be watertight. Sleeve walls and floors which are cored for installation of conduit with steel tubing, grouted and the space between the conduit and sleeve filled as specified herein. Where conduits pierce the roof, refer to architectural specifications and drawings for details. Provide pourable sealant as specified by the Roofing Contractor.

E. Do not use electrical hangers and other supports for other than electrical equipment and materials. Provide not less than a safety factor of five (5) and conform with any specific requirements as shown on the drawings or in the specifications.

F. Do not deviate from the plans and specifications without the full knowledge and consent of the Engineer. Should, at any time during the progress of the work, a new or existing condition be found which makes desirable a modification of the requirements of any particular item, report such item promptly to the Engineer for his decision and instruction.

G. Notify all other contractors of any deviations or special conditions. Resolve interferences between the work of the various contractors prior to installation. Remove, if necessary, work installed which is not in compliance with the plans and specifications as specified above, and properly reinstall without additional cost to the Owner.

H. This Contractor shall furnish all necessary scaffolding, cranes, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

3.2 EQUIPMENT INSTALLATION AND EQUIPMENT

A. Installation:

1. "Provide" and "Install" as used on the drawings and in the specifications means furnish, install, connect, adjust and test except where otherwise specified.

2. Install coordinated electrical systems, equipment and materials complete with auxiliaries and accessories installed.

B. Equipment Location: As close as practical to locations shown on drawings.

C. Working Spaces: Not less than specified in the National Electrical Code for all voltages specified.

D. Inaccessible Equipment:

1. Where the Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, remove and reinstall equipment as directed at no additional cost.

2. "Conveniently Accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and ductwork.

E. Equipment and Materials:

1. Install new equipment and materials unless otherwise specified.

2. Insure that equipment and materials are designed to provide satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements applied to the installation and other code requirements apply to the installation in areas requiring special protection such as explosion proof, vapor-proof, water tight and weather-proof construction.

3.3 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install identification signage which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, time clocks, contactors, separately enclosed circuit breakers, individual breakers, and controllers in switchgear and motor control assemblies, control devices and other significant equipment.

3.4 DRAWINGS AND SPECIFICATIONS

A. The drawings and specifications indicate the requirements for the systems, equipment, materials, operation and quality. They are not to be construed to mean limitation of competition to the products of specific manufacturers.

3.5 SYSTEM VOLTAGES

A. System voltages are as follows:

1. High Voltage: 480/277 volts, three phase, four-wire.

2. Low Voltage: 208/120 volts, three phase, four-wire.

3.6 SUBMITTALS

A. Obtain the Engineer's approval for all equipment and materials before purchasing or delivery to the job site. Delivery, storage or installation of equipment or material

which has not had prior approval is not permitted at the job site. Only equipment and material which have been approved by submittals may be used on this project. Refer to Section 26 00 10, Paragraph 2.3.E for substitutions.

B. Include in all submittals adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval must be legible and clearly identify equipment being submitted.

C. Submit to the Engineer within (30) days after the awarding of the Contract, a complete set of brochures of shop drawings and descriptive data of all material and equipment proposed for the installation. All information shall be submitted electronically in "pdf" format, and shall be separated into electronic "pdf" files in three groups, lighting, switchgear and all others.

D. The submittals must include the following:

1. Information which confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.

2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring must be identified on wiring diagrams.

3. Parts list which must include those replacement parts recommended by the equipment manufacturer.

4. Approvals will be based on complete submission only.

E. Furnish shop drawings for the work involved in sufficient time so that no delay or changes will be caused. Thermofax copies are not acceptable - only permanent type prints are allowed.

F. Verify that shop drawings comply in all respects with the item originally specified. It is the Contractor's responsibility to procure the proper sizes, quantities, rearrangements, structural modifications or other modifications in order for the substituted item to comply with the established requirements.

G. Any shop drawings prepared to illustrate how equipment, conduit, fixtures, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified all the conditions. Obtaining approval thereon does not relieve the Contractor of responsibility in the event the material cannot be installed as shown on the drawings.

H. Shop drawings need not cover detailed installation drawings prepared for the Contractor's own use, but be limited, as in the case of raceways, to necessary departures from the plans as prepared by the Engineer.

I. Submit working scale drawings of apparatus and equipment which in any way varies from these specifications and plans, to be reviewed by the Engineer before the work is started. Correct interferences with the structural conditions before the work proceeds.

J. Submit all shop drawings at the same time in a loose-leaf binder with double index as follows:

1. List the products by designated letter or number as indicated on plan sheets.

2. List the name and manufacturers whose products have been incorporated in the work alphabetically together with their addresses and the name and addresses of the local sales representative.

3. Provide indexes with sheet numbers and quantities of the products listed.

3.7 TESTS AND DEMONSTRATION

A. As equipment and materials are being installed and connected, test the installation for the following:

1. Short circuits and ground faults.

2. Insulation resistance at 500 volts DC.

3. Grounding continuity.

B. After tests are completed and necessary corrections are made, put each system into operation and demonstrate its performance to the satisfaction of the Owner's authorized representative.

C. Provide written documentation of tests and performance as requested by the Owner's authorized representative. The results are to be made part of the Closeout Documents.

D. Furnish all instruments, test equipment and personnel that are required for the particular test. Certify that equipment and gauges are in good working order. Remove equipment subject to damage during test from line before test is applied.

E. After installation is complete the Contractor shall conduct operating test of all electrical systems for approval by the Architect. Test shall include verification of direction of rotation for all motors. The equipment shall be demonstrated to operate in accordance with the requirements of the plans and specifications. The test shall be performed in the presence of the Architect or Engineer.

F. Provide certified test of the grounding electrode system. It shall test to 5 ohms or less.

3.8 COMPLETION AND ACCEPTANCE

A. Upon completion of the work and before final acceptance, perform the duties and provide the documents as follows in accordance with the General Conditions, Supplementary Conditions and Division 1 of Contract.

B. Remove all rubbish, tools and surplus materials accumulated during the execution of the work in this Division.

C. Touch up any equipment or finishes damaged during delivery or installation from the work in this Division.

D. Provide a written one-year guarantee of materials and work except for items that are specified to have a longer warranty. Items that have a published or normal life expectancy of less than one year, such as incandescent lamps are to be covered by the manufacturer's guarantee.

E. Provide systems and equipment installation, operating and maintenance instructions and catalog data for transmittal to the Owner. Place the data in a loose-leaf binder which contains an index of the products listed alphabetically by name and a separate index listing the manufacturers alphabetically by name and including the manufacturer's address and the name and address of their local representative.

F. Instruct the Owner's representative in the proper operation and maintenance of the systems and their elements as required or directed to familiarize the Owner in the operation and maintenance of the systems.

3.9 RECORD DRAWINGS

A. The Contractor shall keep a neat and accurate record of field changes made during construction. Changes shall be penciled in on a separate set of drawings used only for recording changes. At completion of the project the Contractor shall deliver this set to the Architect for preparation of record drawings.

B. Record drawings shall include corrected panel schedules and riser diagram as well as all plan sheets.

3.10 FINALLY

A. It is the intention that this specifications shall provide a complete installation. All accessories and apparatus necessary for complete operational systems shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving this Contractor from furnishing and installing such parts.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Wires and cables.

1.2 RELATED WORK

A. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wire and cable shall be new, shall have size, grade of insulation, voltage and manufacturer name, permanently marked on outer covering at regular intervals.

B. Building Wiring: 95% conductivity, soft drawn conforming to requirements of the NEC and relevant ASTM specifications, copper, 600 volt insulation, dual rated THHN-THWN.

C. Branch Circuit Wiring: Conductors smaller than No. 12 AWG not permitted; No. 8 AWG and larger, stranded construction; smaller than No. 8, either solid or stranded.

D. Fire Alarm System Wiring: UL Listed plenum-rated cable for conductors installed in plenum rated spaces. Coordinate with Authority Having Jurisdiction.

E. Exterior Wiring: Bare stranded for ground, THWN-THHN for all other.

F. Use pre-insulated pressure connectors such as Scotchlock on stranded conductors No. 10 and smaller. Use approved high-pressure crimp sleeve connectors on No. 8 and larger conductors.

G. Where allowed by local inspecting authorities, type "MC" cable shall be allowed for fixture whips. It shall be installed using proper fittings and installation tools per NEC.

H. Low voltage cable is to be installed in conduit in areas with no ceiling or inaccessible hard ceiling.

PART 3 EXECUTION

3.1 INSTALLATION

A. Make conductor length for parallel feeders identical.

B. Lace or clip groups of conductors at panelboards, pull boxes and wireways.

C. Provide copper grounding conductors and straps.

D. Install wire and cable in code conforming raceway.

E. Use wire pulling lubricant for pulling No. 4 AWG and larger wire.

F. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits.

G. Splice only in accessible junction or outlet boxes. Install splices and taps which have mechanical strength and insulation rating equivalent-or-better than conductor and are compatible with conductor material.

H. Color code conductors to designate neutral conductor and phase as follows: 120/208V (phases) black, red, blue, (neutral) white, (ground) green; 277/480V (phases) orange, brown, yellow, (neutral) white with color stripe, (ground) green.

I. All 20 amp circuits are 2-#12, 1-#12 ground unless noted. Use #10 AWG conductors on 20 amp branch circuits which exceed 75 feet to the first outlet.

J. Install home runs as indicated on the panel schedules. Circuits may be grouped into 3-Phase home runs but in no case are more than 3 phase conductors allowed.

K. Sharing of neutrals is not allowed, to include lighting and power circuits.

L. Where conduit and wire are installed on the roof, refer to NEC Section 310.15.(B.)(2)(C) for derating/correcting factors for the distance installed from the roof.

M. No low-voltage wiring is to be visible in open ceiling areas; install in conduit.

3.2 MARKING

A. Identify circuits using wire markers at the following locations:

1. All power and lighting branch circuits and feeders at pull boxes, fixtures, outlets, motors, etc., indicating panel and circuit number at which each circuit or feeder originates.

2. All branch circuits in the panelboard gutters indicating corresponding branch circuit numbers.

3. All signal and control wires at all termination points such as cabinets, terminal boxes, equipment racks, control panels, consoles, etc. Install in accordance with approved schedules prepared by the equipment manufacturer or by the Contractor.

4. Mark both ends of all pull wires with tag reading "PULL WIRE" and numbered to refer to the same pull wire.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Power system grounding.

B. Communication system grounding.

C. Building ground system.

1.2 RELATED WORK

A. Section 26 05 19: Wires and Cables.

B. Section 26 05 34: Conduit.

1.3 REGULATORY REQUIREMENTS

A. Install complete grounding system for the building(s) and all electrical equipment in accordance with National Electrical Code, Section 250.

PART 2 PRODUCTS

2.1 GROUNDING

A. Provide copper grounding conductors for grounding connections sized according to NEC.

PART 3 EXECUTION

3.1 POWER SYSTEM GROUNDING

A. Install NEC sized ground conductor, #12 AWG minimum, in all branch circuit and equipment conduits.

B. Bonding Jumpers: Provide green insulated wire, size correlated with over-current device protecting the wire. Connect to neutral only at service neutral bar.

C. Bonding Wires: Install bonding wire in flexible conduit connected at each end to a grounding bushing.

D. No strap type grounding clamps shall be used. All connections shall be made only after surfaces have been cleaned or ground to exposed metal.

E. The building structural steel shall be grounded as follows:

1. All locations noted on the plans or if not shown, at approximately 75 foot intervals where structural columns are located.

2. All grounding locations are to be made with 1/0 bare copper wire with exothermic welds or Burndy "HyGround" to the column, to in-footing rebar, and to a 3/4" x 8' copper ground rod. Include "Eupher" grounds at all locations shown with grounding symbol.

F. Provide one 1-1/0 bare copper ground wire from the electrical service, and from nearest branch panel, grounding electrode, in 1 1/4" conduit, to the location of each telephone terminal board and Data Room. Provide "Intersystem Bonding Termination" bars at these locations and at the electrical meter where applicable. Termination bars in data or telephone rooms are to be equal to Chatsworth Products, Inc; Model 40153-020. Ground all equipment and metal parts using #6 bare copper ground from this terminal bar.

G. Bond the neutral (grounded conductor) to ground at one location only once per building at the building's main service disconnect. Bond per NEC Article 250.

H. Ground cable trays per N.E.C.

END OF SECTION

SECTION 26 05 29

SUPPORTING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Conduit supports.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. All "Caddy" and "B-Line" hangers are approved.

B. Multiple conduits running horizontally at the same grade and elevation may be supported by trapezes of channels suspended on rods. All support components shall be adequate size for loaded weights being supported. Provide conduit racks with 25% spare capacity.

C. Perforated strap iron or wire shall not be used for supporting conduits or equipment.

D. Where large conduits are supported beneath bar joist, hanger rods shall be secured to angle irons of adequate size. Each angle shall span two or more joist to distribute the weight properly.

E. Supports shall be installed within three (3) feet of each coupling or connector.

F. Vertical Runs: Channel support with conduit fittings, clamp type supports where conduits penetrate floors.

2.2 ANCHOR METHODS

A. Hollow Masonry: Toggle bolts or spider type expansion anchors.

B. Solid Masonry: Lead expansion anchors or preset inserts.

C. Metal Surfaces: Machine screws, bolts or welded studs.

D. Wood Surfaces: Wood screws.

E. Concrete Surfaces: Self drilling anchors or power driven studs.

2.3 METAL FRAMING SYSTEMS

A. Provide metal framing systems for electrical equipment and conduits as required for proper support spacing and approved for the purpose. Powerstrut, Unistrut, Kindorf or

equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

B. Install horizontal supports at eight feet (8') on centers, at fittings and corners, and as required for proper support.

C. Provide a complete installation with all channels, accessories, screws, nuts, washers, inserts, springs, clamps, hangers, clips, fittings, brackets framing fittings, post bases and brackets to provide a structural rigid support or mounting system.

D. On the roof, provide B-Line DB series roof top support bases. Provide two supports per 10' length of conduit. Conduit to be 24" off the roof, minimum. Provide 1/2" rubber pads under the B-Line support blocks. Coordinate to be higher than other trades' piping on the roof. Install conduit in the ceiling space below where possible.

END OF SECTION

SECTION 26 05 34

CONDUIT

PART 1 GENERAL

1.1 WORK INCLUDED

A. Conduit and couplings.

B. Flexible conduit.

1.2 RELATED WORK

A. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 MATERIALS

A. Conduit/Elbows: Rigid steel threaded ANSI C80.1; electrical metallic tubing ANSI C80.3, Schedule 40 PVC.

B. Couplings/Connectors: Threaded; liquid-tight; compression gland. Set screw type products are not allowed.

C. Flexible Conduit: Aluminum or steel armor, plastic jacketed type with liquid-tight connectors used only at motor/equipment terminations. Connectors are to be metal.

D. Metal Clad Cable: Type "MC" cable may be used where allowed by local codes for fixture whips only.

E. PVC or High Density Polyethylene Conduit: HDPE or PVC conduit is acceptable for underground and innerduct applications.

2.2 TYPE

A. Utilize rigid steel conduit (3/4" minimum) in the following locations:

1. In concrete.

2. In exterior locations.

3. Areas subject mechanical abuse.

B. Utilize electrical metallic tubing in other locations, 3/4" minimum. Only E.M.T. is allowed in walls. E.M.T. may be Steel or Aluminum.

C. Make connections to motors and equipment with PVC jacketed flexible conduit and liquid-tight connectors. Minimum size 1/2" for motor connections. Use 3/8" Greenfield flexible conduit only for fixture wiring. Provide sufficient length of flexible conduit to avoid transmission of vibration. Install straps per NEC.

D. PVC conduit may be used for underground service entrance conduits and all low voltage under-slab applications. It is not to be installed exposed. Elbows for service conduits and panel feeders are to be galvanized rigid.

E. Flexible conduit is not allowed within walls.

F. Only service entrance conduits and panel feeder conduits may be installed under the slab, Exception being for floor boxes, cabinets and equipment located away from wals.

G. Conduit on the roof is rigid aluminum.

2.3 MARKING

A. All empty conduit shall be left with a pull string for future use, and shall be permanently marked on each end with like numbers.

B. Mark the conduits and boxes mentioned in this Section paragraph 2.2F as to circuits included and on the record drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. All wiring systems shall be installed in raceways consisting of galvanized steel tubing, PVC conduit, HDPE conduit, rigid galvanized steel, flexible steel conduit or neoprene covered flexible steel conduit.

B. Water tight junction boxes, fittings, expansion joints, compression fittings (for use with all electrical tubing), conduit hubs, etc., shall be provided, for all electrical systems wherever construction dictates, including, but not limited to, outdoor locations.

C. Flexible conduit used in outdoor locations or indoor locations where exposed to continuous or intermittent moisture shall be liquid tight, neoprene covered and UL listed. All fittings for such applications shall be liquid tight, nylon insulated throat type as manufactured by Thomas and Betts, Series 5331, or approved equal.

D. Sufficient slack shall be provided in all flexible conduit connections to reduce the effects of vibration.

E. Insulated bushings shall be used where rigid conduit is installed in any enclosure or junction box. In addition, insulated bushings shall be used on all conduits 1 1/4-inch

and larger.

F. All conduit bends shall have a radius greater than or equal to that stipulated by the NEC.

G. Install conduit concealed in all areas excluding mechanical and electrical rooms and conduit to fixtures in rooms without ceilings.

H. For exposed runs, attach surface mounted conduit with clamps.

I. Coordinate installation of conduit in masonry work.

J. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt or moisture.

K. All conduit systems shall be installed complete and shall be cleaned out before installation of conductors.

L. Alter conduit routing to avoid structural obstructions, minimizing crossovers.

M. Seal conduit with glass fiber where conduits leave heated area and enter unheated area.

N. Provide flashing and pitch pockets making watertight joints where conduits pass through roof or waterproofing membranes. Provide pourable sealant as approved by the Roofing Contractor.

O. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints (review architectural and structural drawings and coordinate with General Contractor to determine expansion joint locations). Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.

P. Avoid routing conduit through public spaces with exposed structure where possible.

Q. Route all exposed conduits parallel or perpendicular to building lines. Coordinate all exposed conduit locations with the Architect prior to rough-in.

R. In exposed ceiling areas stub conduits feeding devices in walls out of the wall as high as possible at bottom of structure or bond beam, whichever is higher.

S. Allow minimum of 6-inch clearance at flues, steam pipes and heat sources. Allow 12-inch clearance at telephone conduits. Where possible, install horizontal raceway runs above water and steam piping.

T. Install conduit system from cabinets to boxes, boxes to outlet and outlet to outlet in such a manner as to be electrically continuous throughout.

U. Make bends or offsets with approved bender or hickey.

V. Where conduits are stubbed up for low voltage cabling or future use, do so neatly; furnish with nylon pull string, conduit caps and labeling on each end.

W. Securely support conduits from the structure using approved type clamps, hangers and assemblies. Space supports according to manufacturer's recommendations and accepted practice. Do not support conduits from ceiling suspension system. In no case exceed support spacing per NEC maximum.

X. Avoid installing conduit on the roof. Where necessary, support conduits via B-Line type DB supports and the appropriate strut straps. Support twice per 10' length of conduit. Use supports which hold conduit 24 inches above roof. Conduit on the roof is rigid aluminum. Provide 1/2" rubber pads under the conduit supports.

Y. Leave a nylon pull string in all empty conduits. Terminate empty conduit stubouts with bushing manufactured for that purpose.

Z. Install properly sized grounding conductor in all conduit.

AA. Elbows for service and panel feeders are to be galvanized rigid conduit.

BB. No conduit may be installed in slab. Conduit for stub-ups and panel feeders are to be installed with the top of the conduit at a minimum of four inches under the slab. Bed with one-half inch washed rock. Conduit for floor boxes is to be installed coming out of the bottom of the floor box and installed under slab.

CC. Provide conduit for all low voltage cable installed in areas which have no ceiling or hard ceilings.

DD. All data/telephone conduits are to be "home-run" to an area above an accessible ceiling. No "Daisy Chaining" allowed.

EE. No "Daisy Chaining" of fixtures is allowed.

FF. Seal conduits where they transition from underground distribution system to the interior of a building or structure, refer to N.E.C. 225.27.

END OF SECTION

SECTION 26 05 37

OUTLET AND PULL BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Outlet boxes.

B. Pull and junction boxes.

1.2 RELATED WORK

A. Section 26 05 53: Identification.

B. Section 26 27 26: Wall Switches, Receptacles and Plate Covers.

C. Section 27 10 05: Conduit for Telephone/Data and TV Raceway System.

PART 2 PRODUCTS

2.1 MATERIALS

A. Boxes: Hot dip galvanized, 1.25 oz/sq.ft. or cadmium plated, conforming to UL requirements.

B. Interior Boxes: Pressed sheet steel blanked for conduit.

C. Exterior Boxes: Corrosion-resistant cast, deep type, with face plate gasket and corrosion-resistant fasteners.

D. For Ceiling: 4" square boxes for receiving three or less 3/4" conduits.

E. For Flush Mounting in Walls: 4" square boxes with matching plaster cover for single or two gang outlets. For larger boxes, use solid type or special units, with flush plates.

F. Surface Mounted: 4" square.

G. Pull Boxes and Junction Boxes: Metal construction, conforming to National Electrical Code, with screw-on or hinged cover.

H. Flush Mounted Pull Boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

I. For floor boxes, refer to the electrical legend on the plans.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount outlet boxes flush in areas other than mechanical rooms, electrical rooms, above removable ceilings, and on exposed structure in rooms without ceilings.

B. Do not install boxes back-to-back in same wall, allow 6" minimum horizontal spacing between boxes.

C. Do not use sectional or handy boxes unless specifically requested.

D. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.

E. For outlets mounted above counters, benches and splashbacks, coordinate location and mounting heights with built-in units. Adjust outlet mounting height to agree with required location for equipment served.

F. Securely mount each outlet box to metal studs with outlet box mounting supports. Secure to at least two studs or install box stabilizers as manufactured by "B-Line" and "Caddy".

G. Do not install more than three 3/4" conduits into one 4" outlet box. Do not use more than one extension ring on a box.

H. For heights of outlets above the finished floor in permanent partitions, use the following unless otherwise noted: To Center of Device:

1. Convenience Receptacles: 18" or as directed.

2. Brackets: As directed.

3. Switches: 46" or as directed.

4. Telephone Outlets: 18" or as directed.

5. Other Outlets: As directed or indicated.

6. Over Counters: 6" above countertop, horizontal at windows or where indicated.

7. Fire Alarm Pull stations: Minimum 42” and Max 48” measured vertically, from the floor level to activating handle or lever.

8. Fire Alarm Audio Visual Device: 80” to top of box

I. Locate pull boxes and junction boxes above removable ceiling or in electrical rooms, utility rooms or storage areas.

J. Install pull boxes of the proper size and depth to accommodate the required conduits and wires.

K. When installing outlet boxes in fire rated walls, provide fire blocking material on the back side of the boxes.

L. Coordinate box mounting height with brick courses, where applicable.

M. Study all devices and light fixtures, providing and installing applicable outlet and back boxes as necessary.

N. Boxes for fire alarm systems are to be painted red.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide and install identification markers.

1.2 RELATED WORK

A. Section 26 05 19: Wires and Cables.

B. Section 26 05 34: Conduit.

C. Section 26 05 37: Outlet and Pull Boxes.

D. Section 26 24 16: Panelboards.

E. Section 26 28 18: Motor and Circuit Disconnects.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide nameplates of laminated phenolic plastic with engraved letters 3/16" high at push-button stations, thermal overload switches, receptacles, wall switches and similar devices where the nameplate is attached to the device plate. At all other locations, make lettering 1/4" high, unless otherwise detailed on the drawings. Securely fasten nameplates to the equipment. Motor nameplates may be non-ferrous metal not less than 0.03" thick, die stamped.

B. Pre-marked, self adhesive, wrap around type markers, manufacturers: Brady, T&B, E-Z Code.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Equip the following items with nameplates:

1. All motors, motor starters, motor control center, push-button stations, control panels, time switches.

2. Disconnect switches, fused or unfused, switchboards and panelboards, circuit breakers, contactors or relays in separate enclosure.

3. Power receptacles where the nominal voltage between any pair of contacts is greater than 150 volts.

4. Wall switches controlling outlets for lighting fixtures or equipment where the outlets are not located within sight of the controlling switch.

5. Special electrical systems at junction and pull boxes terminal cabinets and equipment racks.

B. Adequately describe the function of or use of the particular equipment involved. Where nameplates are detailed on the drawings, use inscription and size of letters as shown. Include on nameplates for panelboards and switchboards the panel designation, voltage and phase of the supply. The name of the machine or the motor nameplates for a particular machine must be the same as the one used on all motor starter, disconnect and push button station nameplates for that machine.

C. The Contractor shall provide typed panel schedules for all electrical panels. Schedules shall reflect actual wiring incorporating all field changes. Copies of Panel Schedules from the construction drawings are not acceptable.

1. Panel Schedules shall reflect room numbers as depicted by the Owner as well as construction numbers.

D. Label all junction boxes with a black permanent marker indicating circuit number and distribution panel or motor control center feeding the circuits contained therein.

E. At each panel, provide a phenolic plastic plate with 1/4-inch high engraved letters, stating the voltages in the panel, the color code of the wires in the panel, power supply origination, the arc flash hazard, and the date of the installation. Attach to the panel cover with stainless steel bolts, locknuts and nuts or locking nuts. At the main disconnect, provide a label noting the available fault current and date of installation.

F. All breakers within each panel are to be labeled.

G. All underground conduits are to be labeled as to each end.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Fuses.

B. Molded-case circuit breakers.

1.2 RELATED WORK

A. Section 26 24 16: Panelboards.

B. Section 26 28 18: Motor and Circuit Disconnects.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fuses:

1. Bussman.

2. Littlefuse.

B. Breakers and Relays:

1. Eaton.

2. General Electric.

3. Siemens.

4. Square D.

2.2 CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components and construction in accordance with published product information and as required for a complete installation.

B. Molded-Case Circuit Breakers: Provide factory assembled molded-case circuit breakers of frame assembled molded-case circuit breakers of frame size voltage and interrupting ratings as indicated on the drawings. Provide breakers with permanent

thermal and instantaneous magnetic trips in each pole and ampere ratings and indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick break action and positive handle indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 Deg. C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

C. Any overcurrent protection device rated 1200A or higher shall be furnished with an enegy-reducing maintenance switching feature with local status indication. This feature shall be furnished with the overcurrent device by the manufacturer.

D. Tandem circuit breakers are not acceptable.

2.3 FUSES

A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings and average time-current and peak let through current characteristics indicated, which comply with manufacturers' standard design, materials and construction in accordance with published product information and with industry standards and configurations.

B. Class RK1 and Class J Current Limiting Fuses: Provide UL Class RK1 and Class J current limiting fuses rated 200,000 RMS symmetrical interrupting current for protecting motors and equipment, equal to Buss LPN-RK or LPS-RK.

PART 3 EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated in accordance with the manufacturer's written instructions and with recognized industry practices to insure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work as necessary to interface installation of overcurrent protective devices.

C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports or cabling.

3.2 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short circuits. Correct malfunctioning units and then demonstrate compliance with requirements.

END OF SECTION

SECTION 26 22 00

TRANSFORMERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Extent of transformer work is indicated by drawings and schedules.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data on power/distribution transformers, including certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers:

1. HEVI-DUTY.
2. Acme.
3. Square "D".
4. Eaton.
5. General Electric.

2.2 POWER/DISTRIBUTION TRANSFORMERS

A. General: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer. Ground step-down transformer secondaries as indicated on the drawings. Do not ground to water pipes.

2.3 DRY-TYPE DISTRIBUTION TRANSFORMERS

A. Transformers 225 KVA or less: Provide factory assembled, general purpose, air cooled, dry type distribution transformers where shown, of sizes, characteristics and rated capacities indicated; three phase, 60 Hz, 4.5% impedance with 480 volts primary and 208Y120 volts secondary. Provide primary winding with 6 taps, 2 above and 4 below full rated voltage for a de-energized tap-changing operation. Insulation to be in accordance with NEMA ST20 Standards for a 220 degree C UL Component Insulation

System and rate for continuous operation at rated KVA. Transformers are to be rated at 150 degrees C temperature rise at standard sound levels. They shall comply with TP1/TP2 Standards.

B. Provide wiring connectors suitable for copper wiring. Mount transformers on ribbed neoprene vibration isolation pad. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap. Provide transformers with fully enclosed sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for floor mounting, unless noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

A. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA and IEEE standards and in accordance with recognized industry practices and insure that products fulfill requirements.

B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.

C. Install units on vibration mounts; comply with manufacturer's indicated installation method. Connect transformer with flexible conduit for both primary and secondary feeders.

D. Connect transformer units to electrical wiring system. Comply with requirements of other Division 26 sections. Wiring connections to be in strict conformity with NEC.

E. Provide all disconnects necessary per NEC.

3.2 GROUNDING

A. Provide tightly fastened equipment grounding and bonding connections for transformers as indicated. Ground secondary windings to building steel, as per NEC 250.

3.3 TESTING

A. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Branch circuit panelboards.

1.2 REGULATORY REQUIREMENTS

A. Construct panelboards to UL standards and provide UL labels.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton.

B. General Electric.

C. Siemens.

D. Square D.

2.2 ENCLOSURES

A. Panels: Surface (or flush) mounted complete with hinged trim with outer door lock and metal directory frame.

B. Panel Can: Galvanized, painted to match trim.

C. Keys: Provide two keys for each panel. Make keys interchangeable for panels on this project.

2.3 120/208 AND 277/480 VOLT PANELBOARDS

A. Panelboards: Three phase, 4-wire, solid neutral design with sequence style bussing, full capacity neutral and bare uninsulated grounding bar bolted to enclosure, composed of an assembly of bolt-in-place molded case automatic air circuit breakers with thermal and magnetic trip and trip free position separate from either "ON" or "OFF".

B. Furnish and install power and distribution panelboards, equipped with thermal magnetic molded case circuit breakers of frame, trip ratings and interrupting capacities, as shown on the panelboard schedule, manufactured in accordance with the latest NEMA standards, listed by Underwriters' Laboratories, Inc. and bearing the UL

label.

C. Panelboard Main Bus, Main Lugs and/or Main Breaker: Copper only with current ratings as shown on the panelboard schedule. Current density in accordance with Underwriters' Laboratories requirements. Bus mounting for circuit breakers of the bolted connection type and accommodating any combination of circuit breaker units without further modification, wiring lugs suitable for copper conductors.

D. Circuit Breakers: Quick make and quick break trip free on overload or short circuit; multi-pole breakers with common trip, wiring terminals suitable for the type conductor specified, bolt-on connections to the bus.

E. Steel Box: As specified by Underwriters' Laboratories standards, end walls removable, size of wiring gutters in accordance with Underwriters' Laboratories standards, trim of code-gauge steel with primer and durable enamel finish, trim doors equipped with spring latch and cylinder lock keyed alike. Each individual circuit to be clearly numbered on the face of the panelboard and a directory for circuit identification provided.

F. Where noted on the plans, provide "SPD" units.

1. On main service equipment provide units equal or better than 125 kA per mode, minimum.

2. On sub panels provide units equal to 80 kA per mode, where called for.

3. All units to be built in to the panels called for. Provide with phase indicating lights and disconnecting means.

G. The panelboard wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time designer as well as personnel who are available to service the project after completion.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide mounting brackets, busbar drillings and filler pieces for unused spaces.

B. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit. Label with construction and permanent room numbers.

C. Provide 4-inch housekeeping concrete pads for all floor mounted units which are located inside the building or outdoors.

D. At each panel, provide a phenolic plastic plate with 1/4-inch high engraved letters, stating the voltages in the panel and the color code of the wires in the panel and the available fault current and date of installation. Attach to the panel cover with stainless steel bolts, locknuts and nuts or locking nuts.

END OF SECTION

SECTION 26 27 26

WALL SWITCHES, RECEPTACLES, AND PLATE COVERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Wall switches.

B. Receptacles.

C. Plate covers.

1.2 RELATED WORK

A. Section 26 05 26: Grounding.

B. Section 26 05 37: Outlet and Pull Boxes.

C. Section 26 05 53: Identification.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Arrow Hart.

B. Bryant.

C. Eagle.

D. General Electric.

E. Hubbell.

F. Leviton.

G. P&S.

H. Substitutions: See Section 26 00 10 - General Electrical Provisions.

2.2 WALL SWITCHES

A. Acceptable Devices

1. Single Pole Switch: Type 1221, or equal.

2. Double Pole Switch: Type 1222, or equal.

3. Three-way Switch: Type 1223, or equal.

4. Four-way Switch: Type 1224, or equal.

5. Dimmers: Lutron "NOVA" Series or equal; size as required per the circuit wattage, 600 watt minimum. Provide type for the fixtures being dimmed.

6. Two-pole switches used to control two loads, like lights and exhaust fans in restrooms, must be "rated" for that duty.

7. Keyed Switches: Provide four keys per switch.

B. Materials

1. 120/277 Volt Switches: Quite slow make, slow break design, toggle handle with totally enclosed case, rated 20 ampere, specification grade. Provide matching two pole, three-way and four-way switches.

2. Color: Coordinate with the Architect.

3. Dimmers: Electronic switching type with toroid filter coil to eliminate RF interference.

4. Two-pole switches used to control two loads, like lights and exhaust fans in restrooms, must be "rated" for that duty.

5. Provide metal barrier between gangs in boxes, where adjacent switches have a potential in excess of 300V between conductors.

2.3 RECEPTACLES

A. Devices

1. Standard Duplex Receptacle: Nema 5-20R. Full gang size, polarized, duplex, parallel blade, U grounding slot, rated at 20 amperes, 125 volts, designed for split feed service.

2. Nameplates: Provide engraved or embossed plastic for receptacles other than standard duplex and standard single receptacles indicating voltage, phase and amperes.

3. Isolated ground outlets to be orange, emergency circuit devices to be red, all other device colors to be coordinated with the Architect.

4. Exterior receptacles are to be "GFI" and rated as "weather resistant".

B. Devices: Receptacles shall be extra heavy duty.

1. Duplex Receptacle: Type 5362, or equal.
2. Duplex Receptacle, Weather Resistant: Type 5362WR, or equal.
3. Single Receptacle: Type 5361, or equal.
4. Single Receptacle, Weather Resistant: Type 5361WR, or equal.
5. Duplex Receptacle, GFCI: Type GF5362, or equal.
6. Isolated Ground Receptacle: Type 5362IG, or equal.

2.4 PLATE COVERS

A. Materials

1. Stainless Steel: Type 302 or 304, No. 4 finish, 0.040 inches thick, accurately die cut, protected with release paper.
2. Cast Metal: Die cast profile, ribbed or strength, flash removed, primed with grey enamel, furnished complete with four mounting screws.
3. Gaskets: Resilient rubber or closed cell foam urethane.
4. Nylon: High-performance, molded nylon.
5. Stamped Metal: For use on 4" square boxes.

B. Device

1. Flush Mounting Plates: Beveled type with smooth rolled outer edge.
2. Surface Box Plates: Beveled, steel, pressure formed for smooth edge to fit box.
3. Weatherproof Plates: CAST METAL, gasketed; for receptacles, provide the weatherproof "while in use" type.
4. Where two-gang boxes are required for single gang devices, provide special plates with device opening in one gang and second gang blank.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate switch mounting location with architectural detail and heights as noted on plans.

B. Run separate neutral for each lighting circuit.

C. Install switches at 46" to center above finished floor, coordinate with brick layers where applicable.

D. Mount receptacles at mounting heights specified on the plans, 18" to center of the box unless noted otherwise.

E. Connect all devices using pigtails. Do not through-wire on device terminals.

F. Mount outlets for electric water coolers and other similar permanently installed plug connected equipment behind equipment according to approved installation drawing, coordinate with the equipment installer.

G. Install coverplates on wiring devices level and with all four edges in contact with finished surface.

H. Use stainless steel plates in all interior areas unless noted. Use steel plates in mechanical and utility type areas.

END OF SECTION

SECTION 26 28 18

MOTOR AND CIRCUIT DISCONNECTS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide and install motor and circuit disconnects.

1.2 REGULATORY REQUIREMENTS

A. Conform to National Electrical Code and to applicable inspection authority.

1.3 REFERENCES

A. Underwriters' Labs, Inc. Annual Product Directories.

B. Classification of Standard Types of Non-ventilated Enclosures for Electric Controllers, National Electrical Manufacturers Association.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton.

B. General Electric.

C. Hubbell.

D. Leviton.

E. Square D.

2.2 EQUIPMENT

A. Provide motor and circuit disconnects with UL label.

B. Single Phase 120 Volt Disconnect Switches: Double pole toggle switch, Leviton MS302.

C. Provide with lockable covers.

D. Three-Phase Motor Disconnect Switches and Single Phase 240 Volt Disconnect Switches: 2 or 3 pole heavy duty fusible or non-fusible as shown, 250 or 480 volt as required in NEMA Type 1 or 3 enclosures. Provide with lugs for suitable wire range, with ground lug, copper current carrying parts, silver-tungsten contacts, reinforced fuse clips for type R rejection fuses.

E. Provide NEMA "4/4X" type disconnects within the kitchen area.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motor and circuit disconnect as recommended by manufacturer and as required by Code.

B. Where required by local authorities, install disconnects for all roof mounted equipment separate from that equipment. Furnish (galvanized) "Unistrut" or angle iron mounting stands with B-Line DB series roof top support base. Coordinate with the equipment supplier and Roofing Contractor.

END OF SECTION

SECTION 26 51 00

INTERIOR BUILDING LIGHTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Installation of luminaires, supports and accessories.

B. Emergency lighting units.

C. Exit signs.

D. Lamps.

E. Ballasts, drivers, and accessories.

1.2 RELATED WORK

A. Section 26 05 19: Wires and Cables.

B. Section 26 05 29: Supporting Devices.

1.3 REFERENCES

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

1.4 SUBMITTALS

A. Submit shop drawings and product data in accordance with General Conditions including pertinent physical characteristics and complete photometric data reports from independent testing laboratory.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Instructions for each product. Installation manuals are required.

1.5 COORDINATION

A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Engineer/Architect and defer ordering until clarified.

B. Supply plaster frames, trim rings and backboxes to other trades.

C. Coordinate with Division 23 to avoid conflicts between luminaires, supports, fittings and mechanical equipment.

D. Conform to requirements of NFPA 70.

E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

F. Products: Listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

G. The lighting wholesale supplier shall have an office and a stocking warehouse within 100 miles of the project site. The distributor/manufacturer's representative shall have an office within 100 miles of the project site, and shall have on staff a full time lighting designer as well as personnel who are available to service the project after completion.

H. Any substitutions to the light fixture schedule shall be proven, by the manufacturer at the discretion of the Engineer, to be of equal or superior quality, material, and performance than the specified light fixtures. All requests for substitutions shall be submitted along with fixture specification sheets, photometric calculations and electronic ies files 10 days prior to bid opening date for review. Substitutions shall be requested in writing only, accompanied by the above listed electronic ies files. Substitutions will not be considered if they are indicated or implied in shop drawing submission without previous formal request. Substitutions will not be considered if they require substantial revision of the contract documents. The Contractor shall be responsible for any and all additional costs required by modifications to architectural, structural, mechanical or electrical facilities, devices, systems, etc. resulting from the approved substitution.

I. Light fixtures and ballasts are to comply with the fixture schedule and the Specifications.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Acceptable Manufacturers

1. Provide products of manufacturers as listed in the lighting fixture schedule or equal, subject to compliance with requirements.

2. Fixtures are to be supplied in manufacturer's standard cartons.

3. Substitutions: See Section 26 00 10 - General Electrical Provisions.

B. Lensed Luminaires

1. Pre-treat housing and finish in high reflectance baked white powder paint on exposed and reflective surfaces giving reflectance of 90% minimum average. Paint shall be applied after fabrication.

2. Reflective end plates may be 20 gauge metal.

3. Provide full 22 gauge steel housing.

4. Provide hinged frames with fully enclosed spring loaded cam latches and T-type hinges, removable for cleaning without tools. Support lay-in lenses on four sides with flip ends on short dimension.

5. Provide gasketing, stops and barriers to form light traps and prevent light leaks.

6. Design luminaire to dissipate ballast and lamp heat.

7. Use formed or ribbed backplates, endplates, reinforcing channels.

8. Provide virgin acrylic diffusers, 0.125" thick nominal, number 12 pattern, 7.8 oz. weight per square foot.

9. Furnish products as indicated in Fixture Schedule, or equal.

C. Recessed Luminaires

1. Supply recessed luminaire complete with trim type required for ceiling system installed. Before ordering, confirm ceiling construction details and architectural finish for each area. Supply with "IC" type housing or gyp board hat over the fixture, where insulation will cover.

2. Fixtures shall be delivered to the job site in factory provided individual cartons.

3. All damaged fixtures are to be replaced

2.2 LAMPS

A. Acceptable Manufacturers

1. General Electric.

2. Osram/Sylvania.

3. Philips.

B. LED Lamps

1. LED Lamps: Manufacturers must have Energy Star/DLC rating or shall offer LM-80 and TM-21 test reports to the public online.

2. LED estimated useful life: Minimum of 50,000 hours at 70% lumen maintenance, calculated based on LM-80 test data.

3. LED fixtures shall be modular and allow for separate replacement of LED lamps and drivers.User serviceable LED lamps and drivers shall be accessible and replaceable from the room side.

4. Light fixture provider shall provide all low voltage control wiring for dimmable fixture.

5. Note lamp color specifications on the fixture schedule, minimum CRI shall be 80.

6. All light fixtures shall be provided with a 5 year warranty on the LED and driver system.

2.3 BALLASTS AND DRIVERS

A. Provide ballasts that meet standards of an electrical testing laboratory and the Certified Ballasts Manufacturers' Association.

B. Acceptable Manufacturers:

1. Universal.

2. Philips/Advance.

3. Osram/Sylvania.

C. LED Drivers

1. LED drivers shall be electic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 " Electronic Drivers for LED Devices, Arrays, or System". LED drivers

shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.

2. Dimmable LED drivers shall be 0-10V type unless otherwise noted on the schedule. Dimmable LED drivers shall be capable of dimming without LED strobling or flicker across their full drimming range.

3. Emergency LED drivers shall be manufactured by a company with a minimum of five (5) years service. They shall be factory installed and tested, to include red pilot lights. They shall be manufactured by Bodine Mfg. and be rated at 1100 lumens, minimum.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lamps in accordance with manufacturer's instructions.

B. Provide spare lamps in the amount of 5% of the total count, or 5 each type, whichever is the greater number.

C. All incandescent lamps shall be replaced at the Date of Substantial Completion.

D. Provide ballasts of compatible design to lamps specified.

E. No "Daisy Chaining" of fixtures is allowed.

F. Install fixtures securely, in a neat and workmanlike manner.

G. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

H. Support all luminaires independent of ceiling framing, directly from building structure by rod hangers and inserts or suspension wire, two per fixture.

I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

J. Install recessed luminaires to permit removal from below.

K. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

L. Install clips to secure recessed grid-supported luminaires in place.

M. Install wall mounted luminaires, emergency lighting units, and exit signs at height as scheduled.

N. Manufactured wiring systems are approved. Provide submittals per Specifications.

3.2 RECESSED LUMINAIRES

A. Perform field inspection, testing, and adjusting in accordance with Section 26 00 10.

B. Install recessed luminaires to permit removal from below to gain access to outlet or pre-wired fixture box.

C. Install an accessible junction box not less than two feet away from the fixture and connect to it by not less than four feet nor more than six feet of flexible conduit, using type of fixture wire approved for this purpose.

D. Mount in suspended ceiling with exposed tee bar grid system, support directly from the building structure by a minimum of two support wires.

E. Hold insulation back from all fixtures by three (3) inches and clear on top.

F. A disconnecting means is required for all ballasted luminaires with double ended lamps. Install per NEC 410.130(G).

3.3 ALIGNMENT

A. Aim and adjust luminaires.

B. Align luminaires, clean diffusers and replace burned out lamps prior to final acceptance.

3.4 FIRE RATED CEILINGS

A. Where recessed fixtures will penetrate either fire-rated ceilings or fire rated gypsum board located above suspended ceilings, the fire-rated ceiling or gypsum board shall be continuous over and around the fixture housing and outlet box. Coordinate the ceiling and fixture installations to insure a continuous fire rated ceiling.

3.5 FINALLY

A. Remove dirt and debris from enclosures.

B. Clean photometric control surfaces as recommended by manufacturer.

C. Clean finishes and touch up damage.

D. Relamp luminaires that have failed lamps at Substantial Completion and all lamps that have been energized during construction for more than 500 hours.

END OF SECTION

SECTION 27 10 05

CONDUIT FOR TELEPHONE/DATA AND TV RACEWAY SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Telephone/Data and TV raceway system.

1.2 RELATED WORK

A. Section 26 05 19: Wires and Cable.

B. Section 26 05 34: Conduit.

C. Section 26 05 37: Outlet and Pull Boxes.

D. Section 26 05 53: Identification.

1.3 SYSTEM DESCRIPTION

A. At TV locations, provide a 4" outlet box and plaster ring with 3/4" raceway to above a drop ceiling in an accessible area. Leave a pull string in each raceway. End each stub up with a 90-degree elbow. Mount as shown on the plans.

B. At all telephone/data locations, provide a 4" outlet box and plaster ring with 1" raceway to an accessible area above a ceiling. Leave a pull string in each raceway. End each stub-up with a 90-degree elbow.

C. Provide a system of cable tray as indicated on the drawings. Provide a system of J-hooks on 4' centers in order to route data cabling to the cable tray in the corridor

PART 2 PRODUCTS

2.1 MATERIALS

A. Conduit: Refer to Section 26 05 34.

B. Outlet and Pull Boxes: Refer to Section 26 05 37.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide an insulated throat connector or plastic bushing where raceways are stubbed out above the ceiling, including a 90-degree elbow on the end of the conduit.

B. Provide a stainless steel blank cover plate for any outlet location which is not to be used. Allow for this quantity to be 50% of total data outlets.

C. Provide conduit for all low voltage wiring which is installed in areas which have no ceiling or hard ceiling.

D. All device plates are to be stainless steel.

END OF SECTION

SECTION 28 31 06

EXISTING FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SCOPE AND RELATED DOCUMENTS

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings and as herein specified.

B. The requirements of the conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this section.

C. The complete installation is to conform to the applicable sections of NFPA-72, Local Code Requirements and National Electrical Code with particular attention to Article 760 and all other applicable regulatory requirements.

D. This Contractor is to modify the system design as necessary to be Code compliant and compliant with the local Authority Having Jurisdiction.

E. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.

1.2 REGULATORY REQUIREMENTS

A. The system and all associated operations shall be installed in accordance with the following:

1. Guidelines of the following Building Code: IBC.

2. NFPA 72, National Fire Alarm Code.

3. NFPA 70, National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

4. Other applicable NFPA standards.

5. Local Jurisdictional Adopted Codes and Standards.

6. ADA Accessibility Guidelines.

B. Equipment: All devices, combinations of devices, notification appliances, and equipment, shall be listed for the purpose for which they are used and shall be installed in compliance with applicable codes and standards.

C. Type of System: The control panel is an existing Edwards EST3 Control Panel. Field verify existing conditions.

1.3 SYSTEM DESCRIPTION

A. Fire Alarm System:

1. Provide all devices and wiring necessary to connect to the existing control panel.

1.4 QUALIFICATIONS

A. Installer: The installation organization shall be a company specializing in the installation of detection and alarm systems. This organization shall have a minimum of 10 years experience with installation of fire detection and alarm systems. The fire alarm system shall be installed by NICET certified installers, one employee being Nicet Level III or greater.

B. Fire Alarm Work is to be done by State Systems. Contact Dustin Madewell at 479-903-6214.

1.5 SUBMITTALS

A. Submit manufacturer product data sheets for all proposed devices and equipment.

B. Provide wiring diagrams, equipment ratings, dimensions, and finishes for all proposed devices and equipment.

C. If submittals, upon review by the Owner and/or the Owners Representative, are found not to conform with the performance, type and quality of products as well as all other requirements of these specifications, the Contractor shall be required to resubmit. The Contractor shall be responsible for the Owner's extra expenses for subsequent review(s) of rejected submittals. Such extra fees shall be deducted from payments by the Owner to the Contractor. Approval of the submittals by the Owner shall, in no case, relieve the Contractor of the responsibility to meet the requirements of this specification.

1.6 PROJECT RECORD (AS-BUILT) DRAWINGS

A. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawings.

B. Record drawings shall include location of end-of-line device locations.

C. Upon completion of the work, and final acceptance by the local authority, the Contractor shall submit record drawings to the Owner and the Engineer.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit Manufacturer data sheets for all equipment installed.

B. Include operating, installation, and routine maintenance instructions.

C. Include Manufacturer's letter stating the date of installation on which the system is operational.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Same as or compatible with existing equipment.

2.2 MANUAL PULL STATIONS

A. Description: Double-action type, red LEXAN or metal finished in red, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

B. Protective Shield: Provide a tamperproof, clear LEXAN shield and red frame that easily fit over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.3 SMOKE DETECTORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1. Factory Nameplate: Serial number and type identification.

2. Operating Voltage: 24 VDC, nominal.

3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.

4. Plug-In Arrangement: Detector and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

5. Environmental Compensation: The detector shall provide a software filtering process that automatically compensates for environmental factors and component aging that affect detector operation.

6. Each detector head shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the detector head LED shall be on steady.

7. Each detector base shall contain a magnetically actuated test switch to provide for easy alarm testing at the detector location and for accessing detector status information. Off-normal conditions shall be indicated by specific identifiable detector LED pulse patterns.

B. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid:

1. Biannual sensitivity reading and logging for each smoke sensor.

2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.

3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.

4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.

5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.

6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.

7. The initial service included in the bid price shall provide the above listed procedures for a period of five years after owner acceptance of the system.

C. Type: Smoke detectors shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionization type detectors may be used.

D. Duct Smoke Detector: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.

1. The detector shall provide on-board sensitivity drift compensation and dirt accumulation tracking.

2. A magnetic test function shall initiate an alarm and provide detailed diagnostic information using the detector status LED.

3. The detector shall provide a multi-function status LED indicator that indicates off-normal conditions by specific identifiable detector LED pulse patterns.

4. The duct housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC or an auxiliary alarm relay with two "Form C" contacts rated at 1A@ 28VDC or ½A@ 120 VAC resistive. This auxiliary relay operates when the detector reaches its alarm threshold. Relay shall be mounted within 3 feet of HVAC control circuit.

5. Duct housing shall provide a relay control trouble indicator yellow LED.

6. Compact duct housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.

7. Duct housing shall provide two (2) test ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke detector.

8. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

9. Each duct detector shall have a Remote Test Station with an alarm LED and test switch.

2.4 HEAT DETECTORS

A. Thermal Detector: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Thermal detector shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

2.5 MAGNETIC DOOR HOLDERS

A. Description: Units shall be listed to UL 228. Units are equipped for wall or arm mounting as indicated and are complete with matching doorplate. Unit shall operate from a 120VAC, a 24VAC or a 24VDC source, and develops a minimum of 25 lbs. holding force.

B. Material and Finish: Match door hardware.

C. Provide at all fire wall doors. Coordinate with the Architectural Life Safety Plan.

D. Provide type as appropriate for door style and location.

2.6 STANDARD ALARM NOTIFICATION APPLIANCES

A. Horn: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings.

B. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

C. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.

D. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.

E. Accessories: The contractor shall furnish the necessary accessories.

F. Provide ceiling mounted devices where indicated on the plans.

2.7 FIRE ALARM WIRE AND CABLE

A. All wire and cable shall be in strict compliance with local codes and the provisions of NEC Article 760 for Power-limited Fire Alarm Circuits.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

1. Factory trained and certified personnel.

2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level III certified personnel.

3. Personnel licensed or certified by state or local authority.

3.2 EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

B. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

C. All necessary devices and wiring which are necessary for a complete, acceptable system shall be supplied regardless whether shown on the plans or not.

D. Provide zone cards and all other equipment necessary for expansion.

E. Provide wire guards to protect all devices installed in gymnasiums and areas subject to physical abuse.

3.3 WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC); National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from

the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Wire installed in open ceiling areas shall be installed in conduit.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

1. Factory trained and certified.

2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified, NICET Level III minimum.

3. Certified by a state or local authority.

4. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

H. Final Test, Certificate of Completion, and Certificate of Occupancy:

1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6 TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of eight hours training.

2. Schedule training with the Owner at least seven days in advance.

END OF SECTION

SECTION 31 11 00

SITE PREPARATION & CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removal of miscellaneous existing site appurtenances.
   2. Protection and/or removal of trees and other vegetation.
   3. Topsoil stripping
   4. Clearing, grubbing and mowing

1.2 RELATED REQUIREMENTS
Construction Drawings

1.3 PROTECTION

A. Provide protection necessary to prevent damage to existing improvements, trees, or vegetation light poles, power poles, fire hydrants, etc., indicated on the Contract Documents are to remain.

B. Protect improvements on adjoining properties and on Owner's property.

C. Restore damaged improvements to original condition as acceptable to parties having jurisdiction.

D. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Streets and roadways shall be thoroughly cleaned and/or swept on a daily basis or more frequently as required by the governing authority.

E. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and the state highway department requirements.

F. Unknown Utility Lines: All known utilities have been shown according to the information available. Contractor is responsible for coordinating with local utility companies and owner to locate and confirm all buried utilities in the construction area. Contractor is to notify Architect immediately if unknown lines, pipes, or other underground objects are encountered.

G. Mow and remove weeds and small undergrowth vegetation in the construction area as defined on the drawings.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 GENERAL PROCEDURE

A. Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Dispose of off-site. Do not remove items elsewhere on site or premises unless specifically indicated. Notify Architect prior to clearing if any item called for as "removed by Owner" remains upon issuance of Notice to Proceed.

B. Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping. Topsoil shall consist of sandy clay surfical soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2" in diameter, weeds, roots, and other objectionable material.

C. Excess topsoil beyond amount specified shall be removed from the site by the Contractor unless specifically noted otherwise on the Drawings.

D. Completely remove stumps, roots, and other debris below proposed subgrade elevation. Fill depressions caused by clearing and grubbing operations with satisfactory soil material as per requirements of Section 31 23 00 unless further excavation or earthwork is required.

E. Remove existing above grade and below grade improvements and abandoned underground piping or conduit necessary to permit construction and other work.

F. Retain boxing and protection for items to remain in construction until finish grade is completed. Repair any damage that occurs to these items without expense to the Owner.

END OF SECTION

SECTION 31 22 00

SITE GRADING

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Section 31 23 00, Excavation and Backfill.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Do all cutting, filling, compacting, and finish grading required to bring entire project area within the limits of construction shown to indicated grades.

B. Subgrades should be consistent with finish grades shown, allowing for an uniform layer of topsoil, properly graded to drain away from the building. Provide smooth ditches or swales as shown to carry water away from the project area without standing.

C. Contractor shall be responsible for setting all grades and slope stakes; and locating all buildings, drives, parking areas, walks and other site items as shown on drawings.

D. Control grading operations to prevent water from running into excavated areas.

3.2 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems as shown on Construction Drawings or as directed by "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.

B. In event that site work on this project will disturb 5 or more acres, Contractor shall not begin construction without posting on site the "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.

C. Contractor shall be totally responsible for conducting storm water management practices in accordance with NPDES permit and for enforcement action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

D. All grading operations are operations that are to be in strict compliance with provisions of the Arkansas Water and Air Pollution Control Act Act 472 of 1949 as amended, AR Ann. 8-4-101 et seq., and the Federal Clean Water Act 33 U.S.C. 1251 et. seq. Contractor shall be responsible for submitting application to state authority and obtaining permits.

E. It shall be the Contractor's responsibility to comply with current OSHA and other local, state, and federal requirements for all excavation and fill operations, and other areas of the work.

F. Contractor to keep dust on site to a minimum the entire duration of construction by means of regular watering. This will include dust created by grading operations, vehicular traffic, and wind.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor and materials for all work under this section.

1.2 RELATED SECTIONS

A. Section 00 42 13 – Proposal for Lump Sum Contract: Unit Prices

B. Section 01 22 13 – Measurement & Payment

C. Section 01 40 00 – Quality Control: Required Special Inspections

D. Section 02 32 00 – Geotechnical Soils Report

E. Section 03 30 00 – Cast-In-Place Concrete

F. Section 31 11 00 - Site Preparation

G. Section 31 22 00 - Site Grading

H. Section 32 11 16 - Crushed Stone Base Course

I. Section 32 92 19 – Seeding

J. Section 32 92 20 – Hydroseeding

K. Section 32 92 23 – Sodding

1.3 SOILS VERIFICATION

A. The **Contractor** shall be responsible for having, GTS, Inc. Geotechnical & Testing Services, 1915 North Shiloh Drive Suite 1, Fayetteville, Arkansas, the registered soils engineer, present on site to examine and conduct tests of soils preparation and construction per IBC required special inspections including filling and grading. The soils engineer shall inspect excavations for foundations, footings, and paving areas perform bearing testing, and will submit a report to general contractor with a copy to the Architect stating conditions observed meet or exceed the limits found in the specifications and are consistent with acceptable construction practices. Construction shall not begin before report is received by the Architect. **Contractor** shall be responsible for any costs for meeting these requirements. **Contractor** shall coordinate inspections, testing, and observation with soils engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 TOPSOIL AND UNSUITABLE SOILS EXCAVATION

A. Strip off topsoil and unsuitable fill material at new building, paving, drives and equipment pad areas. Remove all vegetation, rocks, and any soft soils. Haul away and dispose of unsuitable fill material and excess excavated topsoil material off site. Excavate to minimum thicknesses as noted in geotechnical report, unless otherwise directed by the geotechnical engineer.

B. After stripping unsuitable soils as described in soils report to required depth (refer to "Preparation Of Original Earth" section), the entire building area, drives, walks, and all areas to be paved shall be proof-rolled with a loaded rubber-tired tandem-axle dump truck or scraper weighing at least 25 tons, and any soft soils are to be undercut and replaced with properly compacted fill. Soils engineer shall be present when proof rolling is being performed.

C. After proof rolling, scarify to a depth of at least 6" adjusting the moisture content to within 2 percent of optimum moisture content, then compacted to specified density.

D. Retain sufficient topsoil on site to accomplish final grading.

E. Use no topsoil for compacted fill inside building perimeter.

F. Use no on-site excavated material for fill inside building perimeter, below footings.

G. If insufficient topsoil on site, furnish good topsoil, approved by Engineer, for finish grading and planting areas.

3.2 EARTH EXCAVATION

A. Excavation for walks, pavements, curbs, gutters, roof drainage, conductors, building volume below grade, underfill below slabs on grade, foundation walls, footings and other items indicated by drawings or otherwise necessary for construction.

B. Excavate to elevations and dimensions indicated, plus minimum, yet sufficient, space to permit erection of forms, shoring, drain tile waterproofing, masonry and the inspection of foundations.

C. Dress earth banks and bottoms for footings forms. Bear footings on engineered fill.

D. Insure all exterior footing excavations are below frost line.

E. Remove any existing foundations, footings, piers, and other construction found in the area of new construction.

F. Material to be excavated is assumed to be earth and other materials that can be removed with a Caterpillar D-8 Dozer with single tooth ripper (mass grading), a Caterpillar 330B tracked excavator equipped with rock teeth (utility trenches) or equipment of similar power and capability. If unanticipated rock is encountered within limits of excavation, contractor shall immediately notify Architect and not proceed further until instructions are given and measurements made for purpose of establishing volume of rock excavation. Rock is defined as any stone or boulders that cannot be removed with the use of a Caterpillar D-8 Dozer with single tooth ripper (mass grading), a Caterpillar 330B tracked excavator equipped with rock teeth (utility trenches) or equipment of similar power and capability.

G. Only as a last resort, should explosives be used. Should explosives be necessary, work shall be done by experienced powder men using small charges and in strict accordance with all regulations governing this work. Contractor secure permits required for such work and correct any damage to foundations and/or property caused by improper use of explosives at his expense. Architect to be notified and approval granted before explosives are allowed.

H. Specifically notify Architect to inspect excavations, and receive the Architect's approval before placing concrete.

I. Provide unit price for rock excavation on Bid Form. Rock shall be measured per cubic yard for rock in place. This shall include associated costs for quantity verification by soils engineer.

J. Provide unit prices for engineered fill/placement/compaction and existing earth excavation/removal/haul-off in spaces provided on Bid Form. This shall include associated costs for quantity verification by soils engineer. These unit prices are for Owner's information only. Provide all fill and cut in contract as required to meet requirements shown on drawings and specifications.

3.3 PREPARATION OF ORIGINAL EARTH

A. Floor slab areas should be stripped of all surface vegetation, topsoil and unsuitable soil to depths as called for in geotechnical report. Any soft or unstable materials should be removed and replaced with engineered fill. The subgrade, exposed after stripping and completing any cuts, should be scarified to a minimum depth of 8 inches and moisture conditioned to level within 2 percent of the materials' optimum moisture content. The subgrade should then be compacted to at least 98 percent of the material's maximum laboratory dry density determined in accordance with ASTM Specification D-698, the Standard Proctor procedure.

B. Remove all topsoil below areas to receive sidewalks. Bear concrete sidewalks on natural earth or minimum 12” engineered fill as required to meet elevations as shown on grading plan.

3.4 FILL MATERIAL AND GRADING

A. Place imported engineered fill material beneath the slab. Thickness as required to meet subgrade elevations is in addition to granular under slab fill.

B. Place minimum 12” of imported engineered fill materials beneath paving areas to levels indicated on site plan. Compact as specified.

C. Bear concrete sidewalks on natural earth or minimum 12” engineered fill as required to meet elevations as shown on grading plan. Thickness as required to meet subgrade elevations is in addition to 4”granular under slab fill.

D. Footings to bear on minimum 1’-0” thick engineered fill. The over excavation of existing low strength materials should extend a sufficient distance beyond the edge of the building such that the engineered fill placed beneath footings will extend laterally beyond the edge of the footing at least 8 inches for each 12 inches of engineered fill placed beneath the footing.

E. If soils engineer determines less fill material or more is required, it shall be provided or deducted from contract. Refer to proposal form for unit pricing.

F. In general, place no interior or exterior fills less than 3 days after concrete forms for structure have been removed, and then only when approval is received from Architect.

G. Place fill in layers not exceeding 8" in loose thickness, thoroughly compacting with powered tamp. Moisture content of fill material is to be controlled to between 2 percent below and 3 percent above optimum as determined by ASTM D698. Compact fill material to a minimum of 95 percent of the maximum Standard Proctor dry density, ASTM Specification D-698.

H. Final fill under concrete floor slabs shall consist of 4 inches of granular sub-base material immediately below the concrete floor slab. The sub-base material shall be clean, washed, crushed limestone conforming to ASTM C33, Size 57, or equal spread level to allow for minimum required concrete thickness. The upper portion (approximately 2 inches) to be “choked” off with limestone fines or sand. Tamp tightly into place, prior to placement of termite treatment and vapor barrier.

I. Roll, tamp and otherwise compact other site fill.

J. Cut and fill with debris-free earth to bring lawn areas affected by this construction to approximately 4" below finish grades. Grade uniformly between elevations give and "round-out" any abrupt changes in slope during final grading operations.

K. Haul away and dispose of any surface rubble and debris.

L. Remove any groundwater accumulated in excavations prior to placement of concrete. Soils Engineer to verify conditions are acceptable and bearing capacity is at or exceeds specified bearing pressure

3.5 TOPSOIL

A. After rough grading is completed and approved, scarify subsoil in areas to be lawns to a depth of 3" and place a layer of topsoil there over, providing additional topsoil required to give thickness specified.

B. Topsoil material: Fertile, natural topsoil, typical of locality, free from stones, debris, clay and weeds.

C. Topsoil minimum thicknesses: 4" seeded and sodded areas, 12” landscaped areas. (Adjust final cut and fill depth as required to accommodate lawn type.)

C. Fill to finish grade indicated, eliminate water pockets and irregularities, ready to receive seed or sod.

D. Finish site grading to be smooth throughout contours. Abrupt changes, uneven, or undulating grading will not be accepted unless shown as such on grading plan.

3.6 EXTENT OF FINISH GRADING

A. Cut, fill and grade to extent of contours and elevations indicated by drawings.

B. At building perimeter, keep finish grades generally 6” below finish floor elevation with exception of areas at drives and walks.

3.7 QUANTITY VERIFICATION

A. Contractor to be responsible for costs incurred by Surveyor Geotechnical Engineer, or other qualified individuals to verify quantity of rock or additional unsuitable soil removed. This shall be included in the unit price costs.

3.8 OBSERVATION AND SPECIAL INSPECTIONS

A. Soils cut and fill operations shall be observed periodically by the Architect/Engineer prior to placing of concrete footings and slabs, and paving. Inspection of soils bearing pressure, verification of soils, and cut/fill operations for conformance to the construction documents and IBC shall be performed by the designated third party Special Inspector.

3.9 TEST REQUIRED:

Contractor shall coordinate compaction tests on the building and paving areas from a recognized testing laboratory, approved by the Architect, at the following intervals. Contractor is to pay for compaction testing. **Location of each test shall be noted on report.**

A. Minimum three tests per each layer of fill placed, one per each 2,500 sq. ft. of building area.

B. Minimum three tests per each layer of fill placed, one per each 5,000 square feet of pavement area.

C. Density testing of any gravel or crushed stone base course with fines or any over-excavated footing is to be compacted to a minimum of 95 percent of the maximum Standard Proctor dry density, ASTM Specification D-698.

D. If any test results fall below required minimum, the testing company is required to contact Contractor and Architect immediately.

END OF SECTION

SECTION 31 23 16

ROCK REMOVAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of identified and discovered rock during excavation.

B. Use of explosives to assist rock removal.

C. Incorporating removed rock into fills and embankments.

1.2 RELATED SECTIONS

A. Section 00 42 13 – Unit Prices

B. Section 02 32 00 – Earthwork

C. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities

D. Geotechnical Report for boring locations and findings of subsurface materials and conditions.

E. Construction Drawings

1.3 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA) latest edition
495 Code For Explosive Materials

1.4 ENVIRONMENTAL REQUIREMENTS

A. Determine environmental effects associated with proposed work and safeguard those concerns as regulated by law and local governing authorities by reasonable and practical methods.

1.5 PROJECT CONDITIONS

A. Discrepancy with Construction Drawings and Specifications regarding amount and type of rock to be removed shall immediately be brought to attention of the Owner or his designated representative. Revised removal plan and schedule shall subsequently be provided and followed.

1.6 QUALIFICATIONS

A. Submit records of documented experience to the Owner or his designated representative prior to removal of rock by blasting.

1.7 QUANTITY VERIFICATION

A. Contractor to be responsible for costs incurred for surveyor Geotechnical Engineer, or other qualified individuals to verify quantity of rock removed. This shall be included in the Unit Price cost.

PART 2 PRODUCTS

2.1 MATERIALS

A. Explosives, detonator/delay device, blast mat materials and accessories shall be as recommended by explosive supplier and shall comply with requirements of applicable governing authorities.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify site conditions and note subsurface conditions affecting work of this section.

B. Establish required lines, grades, and elevations that will determine extent of proposed rock removals.

3.2 ROCK EXCAVATION

A. Rock excavation is defined as igneous, metamorphic, or sedimentary rock that cannot be removed by rippers or other mechanical methods and, therefore requires drilling and blasting. Cut rock to form level bearing at bottom of footing and trench excavations. In utility trenches excavate rock to 6-in. below invert elevation of pipe. Remove shaled layers to provide sound and unshattered base for footings or foundations.

B. Comply with laws, rules, and regulations of Federal, State, and local authorities and insurer which govern storage, use, manufacture, sale, handling, transportation, licensing, or other disposition of explosives. Take special precautions for proper use of explosives to prevent harm to human life and damage to surface structures, utility lines, or other subsurface structures. Do not conduct blasting operations until persons in vicinity have had ample notice and have reached positions of safety.

C. Contractor shall save harmless the Owner or his designated representative, Architect, and Engineer from claims growing out of use of such explosives. Removal of materials of any nature by blasting shall be done in such manner and at such time as to avoid damage affecting integrity of design and to avoid damage to new or existing structures included in or adjacent to work. It shall be Contractor's responsibility to determine method of operation to ensure desired results and integrity of completed work.

D. Use Controlled Low Strength Material (CLSM) / Flowable Fill or other acceptable materials to replace rock overblast or overexcavation in building area to facilitate placement of utilities and future footings.

END OF SECTION

SECTION 31 23 23

PIPELAYING

PART 1 GENERAL

1.1 SCOPE

A. Section includes the Work necessary to install water, sewer, and storm drainage piping and appurtenances.

1.2 RELATED WORK

A. Trenching, backfill and compacting is specified in Section 31 23 33.

1.3 QUALITY ASSURANCE

A. Provide workmen with skill to ensure embedment of pipe.

B. Methods of Testing
   1. The moisture density relations of materials shall be determined in the laboratory in accordance with AASHTO T-99 or T-180, as specified.
   2. Field density of backfill shall be determined in accordance with ASTM D2922.

1.4 PUBLIC WORK

A. Comply with the Bentonville Water Utilities standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

PART 2 PRODUCTS

2.1 EMBEDMENT

A. Class I material consists of manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size.

B. Class II material consists of coarse sands and gravel with maximum particle size of 1-1/2 inches (40 mm), including variously graded sands and gravels containing small percentage of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.

   GW-Well graded gravels and gravel-sand mixtures, little or no fines, 50 percent or more retained on a No.4 sieve, more than 95 percent retained on a No. 200 sieve.

GP-Poorly graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on a No. 4 sieve. More than 95 percent retained on a No. 200 sieve. Clean.

SW-Well-graded sands and gravelly sands, little or no fines. More than 50 percent passes a No.4 sieve. More than 95 percent retained on a No. 200 sieve. Clean.

SP-Poorly graded sands and gravelly sands, little or no fines. More than 50 percent passes a No.4 sieve. More than 95 percent retained on a No.4 sieve. Clean.

2.2 BACKFILL

A. Select materials are defined as good earth, sand, or gravel and shall be free from rocks larger than 1-1/2 inches in diameter or hard lumpy materials. Select materials require hand placement and consolidation.

B. Protection cover shall be defined as backfill from the top of the pipe to a point 12 inches above the top of the pipe and shall consist of select material as defined in paragraph 2.1A.

C. Backfill over the protection cover shall be free from cinders, ashes, refuse, vegetable, or organic material, boulders, rocks or stones having dimension greater than 6 inches, frozen soil, or other material that in the opinion of the Engineer is unsuitable.

PART 3 EXECUTION

A. Examine the pipe and appurtenances for compliance with specifications.

B. Reject pipe and appurtenances not in compliance with specifications.

C. Remove foreign matter from pipe and appurtenances before lowering into excavated area.

D. Pipe bedding
   1. For PVC pipe and fittings, place 6-inch minimum of Class I or Class II material between excavated trench bottom or stabilized trench bottom and bottom of pipe or fitting as embedment. Embedment material shall be tamped by hand or approved mechanical methods so as to provide a uniform and continuous bearing support for the pipe at every point along the pipe barrel. Class I material shall be used for haunching to the spring line of the pipe, and to 6 inches over the top of the pipe. Embedment shall be compacted to a standard proctor density of 85 percent as defined in AASHTO T-99.
   2. For iron pipe and appurtenances, place 4 inch minimum of Class I or Class II material between excavated trench bottom or stabilized trench bottom and bottom of pipe or appurtenance. Embedment material shall be tamped by hand or approved mechanical methods so as to provide a uniform and continuous bearing support for the pipe at every point along the pipe barrel. Class I material shall be used for haunching to the spring line of the pipe, and to 6 inches over the top of the pipe. Embedment shall be compacted to a standard proctor density of 85 percent as defined in AASHTO T-99.

E. Place pipe and appurtenance to planned line and elevation.
   1. Place gravity waste water pipe from low end to high end with pipe bells facing upstream.
   2. Place potable water pipe with bells facing the direction of laying.
   3. Cover open end of laid pipe to prevent rodents and debris from entering pipe.

F. For iron pipe, place Class I material 6 inch maximum layers, compacted to 85 percent maximum density standard proctor, to top of pipe. Ensure that Class I material is compacted against haunch area of pipe.

G. Pipe Covering:
1. Place protection material to a minimum 12 inch depth over top of pipe and fittings. Place in 6 inch maximum layers, compacted to 85 percent standard proctor density.
2. For pipe beneath a drivable surface, Class 7 aggregate backfill shall be placed to the top of subgrade.

H. See Section 31 23 33 for remainder of backfill requirements.

I. Existing Utility Crossing: Expose all utilities located between two manholes a minimum of 24 hours before the downstream manhole is constructed. Wherever possible, sewer will be adjusted to provide necessary clearance.

END OF SECTION

SECTION 31 23 33

EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the excavation, bedding, and backfilling of utilities necessary to perform work indicated on Drawings and Contract Documents.

B. Comply with the City of Bentonville standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

1.2 RELATED REQUIREMENTS

A. Construction Drawings

B. Section 31 11 00 - SITE PREPARATION & CLEARING

C. Section 31 23 23 - PIPELAYING

C. Section 02 32 00 – GEOTECHNICAL SOILS REPORT

1.3 LOCAL REQUIREMENTS

A. Contractor to verify with city officials that this specification meets or exceeds local requirements. Local requirements shall supercede requirements of this specification unless noted otherwise.

1.4 SUBMITTALS

A. Shop Drawings or details pertaining to Site Utilities are not required unless use of materials, methods, equipment, or procedures contrary to Drawings or these specifications are proposed. Do not perform work until required shop drawings have been accepted by Owner.

B. The Contractor shall contact all utility companies and determine if additional easements will be required to complete the project. Contractor shall provide written confirmation of the status of all easements to the Architect at the time of the preconstruction conference.

PART 2 PRODUCTS

2.1 BEDDING MATERIAL

A. Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U.S. Sieve Size	Percent Passing (by weight)
1 Inch	100
3/4 Inch	100
3/8 Inch	20-55
No. 4	0-10
No. 8	0-5

B. Steel Casing Pipe: Comply with AWWA C-201 or C-202, minimum grade B, size and wall thickness as indicated on Drawings.

2.2 DETECTION TAPE

A. Provide metallic detection tape located approximately 12” above pipe or conduit, where in ground utility lines are buried outside building footprint. Tape shall be continuous and be marked, indicating utility type (i.e. water, sewer, gas electric, etc.)

PART 3 EXECUTION

3.1 SUMMARY

A. Set all lines, elevations, and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Maintain in operating condition existing utilities, active utilities, and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

3.2 EXCAVATION, TRENCHING, AND BACKFILLING

A. Perform excavation as indicated for specified depths. During excavation, pile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave- ins.

B. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.

C. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

D. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

3.3 TRENCH EXCAVATION

A. The local utility companies shall be contacted before excavation shall begin. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

B. All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

D. Trench width requirements below the top of the pipe shall not be less than 12" nor more than 18" wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

E. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:
   1. Water Mains: 36" to top of pipe barrel or 6" below the frost line (established by the local building official), whichever is deeper.
   2. Sanitary Sewer: Depths, elevations, and grades as indicated on Drawings.
   3. Storm Sewer: Depths, elevations, and grades as shown on Drawings.

4. Electrical Conduits: 24" minimum to top of conduit or as required by NEC 300-5, NEC 710-36, codes, or the local utility company requirements, whichever is deeper.
5. Gas Mains and Service: 30" minimum to top of pipe, or as required by the local utility company, whichever is deeper.

F. Please note that the trench depths listed above are minimum depths. Verify with local authority having jurisdiction for minimum trench depth requirements.

3.4 SHEETING AND BRACING

A. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheeting may be removed after excavation has been backfilled sufficiently to protect against damaging or injurious caving.

3.5 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit that is installed to designated elevations and grades to line and grade 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 8" layers, measured loose, to the top of the trench.

3.6 TRENCH BACKFILLING

A. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact as specified, to properly correct condition in an acceptable manner.

B. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in lifts or layers not exceeding 8" of loose material. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698 (or 92% of optimum density in accordance with ASTM D 1557).

C. Compaction: Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Compaction Testing: Independent testing laboratory shall perform test at intervals not exceeding 200'-0" of trench for each 8" of compacted trench backfill and furnish copies of test results as specified. Contractor is to pay for compaction testing.

E. Finished Surface: After compaction and testing are complete, cap the trench with an assembly that is flush with and matches the existing construction in materials and method of application.

END OF SECTION

SECTION 31 31 16

TERMITE CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED

A. Soil treatment below slabs on grade for subterranean insects.

B. Soil treatment at foundation perimeter, for subterranean insects.

1.2 REFERENCES

A. Environmental Protection Agency (EPA)
   1. EPA - Federal Insecticide, Fungicide and Rodenticide Act.

1.3 QUALITY ASSURANCE

A. Materials: Provide certification that toxicants conform to requirements of authority having jurisdiction.

B. Material Packaging: Manufacturer's labels and seals identifying content.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable requirements for application licensing and authority to use toxicant chemicals.

1.5 SUBMITTALS

A. Product Data: Submit through General Contractor to Architect.
   1. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.
   2. Submit manufacturer's application instructions.

1.6 PROJECT RECORD DOCUMENTS:

A. Accurately record moisture content of soil before treatment, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.7 WARRANTY

A. Provide five year warranty for material and installation. Cost for the five year warranty period will be included with the warranty.

B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.

C. Inspect work annually and report in writing to Architect.

D. Owner reserves right to renew warranty for an additional five years.

E. Warranty period will not begin until date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Toxicant Chemical: Water based emulsion, uniform composition, synthetic dye to permit visual identification of treated soil.

B. Approved chemicals.
1. Bifenchrin - Trade name Baseline, 1% emulsion.
2. Cypermethrin - Pyrethroid, trade name Demon TC, 1%.
3. Imidacloprid - Trade name Premise 75, .05% to .1%.
4. Cyano - Trade name Tirbute, .5% to 1%.
5. Other chemicals may be used as approved by appropriate regulatory agencies.

C. All instructions on the manufacturers label shall be closely followed and all state and federal laws strictly obeyed.

2.2 MIX DILUTION

A. Dilute and mix toxicant chemical to manufacturer's instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.

B. Beginning of application means acceptance of soil condition.

3.2 APPLICATION

A. Apply toxicant within 12 hours before installation of vapor barrier under slab-on-grade or finish grading outside foundation walls. If rain occurs after initial treatment and before installation of vapor barrier, re-application of termite treatment will be required.

B. Apply toxicant to soil at the following rates, using metered applicator:
   1. Under floor slabs-on-grade: One gallon per 10 sq. ft.
   2. Both sides of exterior foundation wall: Note-Treat exterior side of foundation walls and/or turn-down slab edges prior to topsoil placement.
      a. Concrete: Four gallons per 10 lineal feet, to depth of one foot.
      b. Masonry: Four gallons per 10 lineal feet for each foot of foundation depth.
   3. Two gallons per lineal foot at foundation penetrations.

C. Apply as a coarse spray to ensure uniform distribution.

D. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. Retreat disturbed treated soil.

3.3 RE-TREATMENT

A. If inspection identifies the presence of termites, retreat soil and retest.

F. Use same toxicant as for original treatment.

3.4 TREATMENT CONFORMATION

A. Colored Dye to be added to treatment mix for visual inspection.

B. Keep application tickets on site for Architect's review. If long distance observation is made by Architect by viewing photos sent by email, forward treatment tickets to Architect for confirmation.

END OF SECTION

SECTION 31 35 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Installation of temporary and permanent erosion control systems.

B. Installation of temporary and permanent slope protection systems.

C. Contractor Responsibilities.

1.2 RELATED SECTIONS

A. Section 31 11 00 - Site Preparation

B. Section 02 32 00 – Earthwork

C. Section 32 92 19 – Seeding

D. Storm Water Pollution Prevention Plan

E. Construction Drawings

1.3 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties and water resources from erosion and sediment damage throughout life of contract.

1.4 CONTRACTOR RESPONSIBILITIES

A. **The Owner (through the Civil Engineer) will submit the Notice of Intent to the Arkansas Department of Environmental Quality (ADEQ) and obtain the NPDES Permit prior to beginning construction**. The Contractor will be responsible for implementing and maintaining all requirements under the Storm Water Pollution Prevention Plan (SWPPP). This includes, but is not limited to, installing best management practices (BMP), maintaining/replacing of BMPs when needed, stabilizing all disturbed areas on the project, completing inspection report forms at the frequency specified in the permit, and maintaining the SWPPP, all required postings, and rain gauge on the site. If the City of Bentonville, AR, is issued a citation or fine for any storm water infractions or deficiencies by ADEQ Environmental Protection Agency (EPA), or any other Entity having jurisdiction over storm water quality, because of negligence by the Contractor in maintenance of the SWPPP, the Contractor will be responsible for payment of the fines or citation fees. The amount of the fines shall be withheld out of the amount due to the Contractor. The BMPs shown in the erosion control plans are minimum

measures and additional or different BMPs may be necessary in the field. The contractor shall add or modify BMPs as necessary and document these changes in the SWPPP as required.

B. A copy of the permit and SWPPP will be furnished to the Contractor at the Pre-construction meeting.

PART 2 PRODUCTS

2.1 MATERIALS

A. Quick growing grasses such as wheat, rye, or oats in accordance with Section 32 92 19.

B. Stone check dams as specified on Construction Drawings.

C. Fencing for siltation control as specified on Construction Drawings.

D. Acceptable Filter/Drainage Fabrics:
1. Mirafi 140 N
2. Dupont Typar HR
3. Approved alternate

E. Curlex blankets by American Excelsior Company or approved alternate.

F. Temporary mulches such as loose hay, straw, netting, wood cellulose, or agricultural silage.

G. Fence stakes shall be minimum of 5-ft in length and be either metal stakes or 2-in. x 2-in. hardwood stakes driven 1'-6" into ground.

H. Rip-Rap in accordance with Section 31 37 16.

PART 3 EXECUTION

3.1 PREPARATION

A. Review Construction Drawings and Storm Water Pollution Prevention Plan.

B. Deficiencies or changes on Construction Drawings or Storm Water Pollution Prevention Plan as it is applied to current conditions will be brought to the attention of the Owner or his designated representative for remedial action.

3.2 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion control systems in accordance with Construction Drawings and Storm Water Pollution Prevention Plan.

B. The Owner or his designated representative has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures. Contractor will be required to incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls. Cut slopes shall be permanently seeded and mulched when finish grades are achieved as excavation proceeds to extent considered desirable and practical.

C. Temporary erosion control systems installed by Contractor shall be constantly maintained to control siltation during life of contract. Contractor must respond to maintenance or additional work as required by the Owner or his designated representative within 48 hours.

D. Additional material and work required and authorized by the Owner or his designated representative which is beyond extent of Construction Drawings and Storm Water Pollution Prevention Plan shall be paid for by Owner.

E. Contractor is totally responsible to protect all slopes when erosion begins by whatever methods necessary.

END OF SECTION

SECTION 32 11 16

CRUSHED STONE BASE COURSE

PART 1 GENERAL

1.1 SCOPE

A. This Section covers the materials for crushed stone base course to be used as a base material for asphaltic and concrete paving.

B. This material may also be used for embedment for water and sewer utility lines.

1.2 RELATED WORK

A. Section 31 23 00: Excavation and backfill-filling and site preparation for streets and parking areas.

B. Section 32 12 16: Asphaltic Concrete Paving

C. Section 32 13 13: Portland Cement Concrete paving

D. Standard Specification for Highway Construction, ARDOT, Edition 2014

1.3 QUALITY ASSURANCE

A. The moisture density relations of material shall be determined in the laboratory in accordance with AASHTO T-180.

B. Compacted base shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and re-compacting to the specified density, as directed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Crushed stone base course shall consist of crusher run stone or a mixture of crushed stone and natural fines uniformly mixed and so proportioned as to meet all the requirements hereinafter specified, with the further provision that a mixture of crushed stone and natural fines shall contain not less than 95 percent crusher produced material.

B. Stone shall be hard and durable with a percent of wear by the Los Angeles Test (AASHTO T96) not greater than 45.

C. Shale and slate shall not be used for crushed stone base course.

D. The material furnished shall not contain more than 5 percent by weight of shale, slate and other deleterious matter.

E. Crushed stone base course shall conform to the following grading (AASHTO T 11 and T 27) and crushing (ARDOT Specification Section 303) requirements.

Size of Sieve	Percent Passing by Weight
	Class 7
1-1/2"	100
1"	60-100
3/4"	50-90
3/8"	
#4	25-55
#10	
#40	10-30
#200	3-12

1. The fraction passing the No. 200 sieve shall not be greater than three quarters the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6.

2. When it is necessary to blend two or more materials, each material shall be proportioned separately by weight through mechanical feeders to insure uniform production. Pre-mixing or blending in the pit to avoid separate feeding will not be permitted.

3. The specific type of crushed stone for different applications shall be as specified or shown on Drawings.

PART 3 - EXECUTION

3.1 BASE COURSE

A. The base course material shall be placed on the completed and approved subgrade, which has been bladed to substantially conform to the grade and cross section shown on the Drawings.

B. The sub-grade shall be prepared as specified and shall be free from an excess or deficiency of moisture at the time of placing the base course.

C. The subgrade shall also comply, where applicable, with the requirements of other items that may be contained in the contract that provide for the construction, reconstruction or shaping of the subgrade or the reconstruction of the existing base course.

D. Base course material shall not be placed on a frozen subgrade.

E. The crushed stone shall be placed on the subgrade or previous base course layer in lifts not to exceed 4" and spread uniformly to such depth and lines that when compacted it will have the thickness as follows:
   1. Medium Duty Asphalt Paving Areas: 9" base course
   2. Light Duty Asphalt Paving Areas: 6" base course.
   3. Concrete Paving Areas: 4" base course

F. The spreading shall be done the same day that the material is hauled, and shall be performed in such a manner that no segregation of coarse and fine particles nor nests or hard areas caused by dumping the crushed stone on the subgrade will exist.

G. To ensure proper mixing, the crushed stone shall be bladed across the roadbed before being spread. Care must be taken to prevent mixing of subgrade or shoulder material with the base course material in the blading and spreading operation.

H. The crushed stone shall be substantially maintained at optimum moisture during the mixing, spreading, and compacting operations, water being added or the material aerated as may be necessary.

I. The specified grade and section shall be maintained by blading throughout the compaction operation.

J. The material in each course shall be compacted to a density, as determined by AASHTO T 238, Method B, of not less than 95% of the maximum laboratory density determined in the laboratory by AASHTO T 180, Method D. The aggregate shall be compacted across the full width of application.

K. The crushed stone shall be compacted across the full width of application.

L. The compacted base course shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and re-compacting to the specified density, as required by the Architect.

M. Compaction testing shall be as specified in Section 31 23 00

END OF SECTION

SECTION 32 12 16

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Placement of asphaltic paving, including prime coat materials and installation, and hot mix asphalt binder and surface course.

1.2 RELATED SECTIONS

A. General quality control requirements and the division of responsibilities for laboratory and field testing are specified in the General Requirements.

B. Site preparation is specified in Section 31 23 00.

C. Pavement Markings: Section 32 17 23.

D. Sub-grade preparation and base course construction are specified Section 32 11 16.

E. Standard Specification for Highway Construction, ARDOT, Edition 2014

1.3 REFERENCES

A. AASHTO
1. M 17, “Mineral Filler for Bituminous Paving Mixtures”
2. M 81, “Cut-Back Asphalt (Rapid-Curing Type)”
3. M 140, “Emulsified Asphalt”
4. M 145, “The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes”
5. M 208, “Cationic Emulsified Asphalt”
6. M 226, “Viscosity Graded Asphalt Cement”
7. T 30, “Mechanical Analysis of Extracted Mixture”
8. T 44, “Solubility of Bituminous Materials in Organic Solvents”
9. T 48, “Flash and Fire Points by Cleveland Open Cup”
10. T 49, “Penetration of Bituminous Materials”
11. T 51, “Ductility of Bituminous Materials”
12. T 78, “Distillation of Cut-Back Asphaltic (Bituminous) Products”
13. T 96, “Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine”
14. T 102, “Spot Test of Asphaltic Materials”
15. T 104, “Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate”
16. T 166, “Bulk Specific Gravity of Compacted Bituminous Mixtures”

B. ARDOT
   1. Standard Specifications for Highway Construction, 2014 Edition, referencing the following specific sections:
      a. 401, Prime and Tack Coats and Emulsified Asphalt in Base Course
      b. 403, Materials and Equipment for Prime, Tack, and Asphalt Surface Treatment
      c. 404, Design and Quality Control of Asphalt Mixtures
      d. 406, Asphalt Concrete Hot Mix Binder Course
      e. 407, Asphalt Concrete Hot Mix Surface Course
      f. 409, Materials and Equipment for Asphalt Hot Mix Binder and Surface Courses
      g. 410, Construction Requirements for Asphalt Hot Mix Binder and Surface Courses
   2. ARDOT Test Method 449/449A
   3. ARDOT Test Method 450
   4. ARDOT Test Method 460

C. ASTM standards may be substituted for the listed AASHTO standard when the standards are essentially the same.

1.4 SUBMITTALS

A. Submit product information on prime coat and tack coat products, and on asphalt cement when requested by Owner or his designated representative.

B. Submit mix design information in accordance with paragraph 2.4.

C. Submit source quality control information when requested by Owner or his designated representative in accordance with Paragraph 2.5.

1.5 QUALITY ASSURANCE

A. Testing for materials and construction performance shall be at the option of Owner, or as specified herein. Owner has the authority to require any test needed, in their opinion, to demonstrate that the quality of the construction materials or workmanship meet the specified requirements.

B. Site tests shall be made in the presence of Owner or his designated representative. Required tests must demonstrate compliance with the specifications before the paving work will be accepted.

1.6 DELIVERY, STORAGE, AND HANDLING

A. HMAC mixtures shall be transported from mixing plant to the Work in vehicles with clean, tight beds.
B. When mixtures are hauled more than 15 miles, or when mixtures are being placed between November 1 and April 1, cover beds of vehicles with canvas or other suitable material to retard loss of heat. Cover shall extend over the sides and ends of truck bed and shall be securely fastened. Store cover on truck at all times regardless of haul distance or time of year.

C. Utilize sufficient number of vehicles to provide a continuous operation on the roadway.

D. Use only non-petroleum release agents.

PART 2 PRODUCTS

2.1 SOURCES

A. Obtain aggregate from a permanently established quarry regularly engaged in supplying mineral aggregates for asphaltic concrete mixtures. Quarry shall have an established quality control program.

B. Obtain asphalt cement from sources that have executed a certification agreement with ARDOT.

C. Obtain asphaltic concrete mixtures from a permanently established mixing plant regularly engaged in supplying paving materials conforming to ARDOT specifications. Applicable provisions of ARDOT 409.03 shall apply, except that Owner or his designated representative will not be inspecting or monitoring operations of the plant.

D. **ABSOLUTELY NO RECYCLED ASPHALT WILL BE USED ON THIS PROJECT FOR ASPHALT PAVING.**

2.2 PRIME AND TACK COATS

A. Prime coat shall be emulsified petroleum resin, EPR-1, manufactured by Blackridge, or equal.

B. Bituminous tack coat shall be rapidly curing cutback asphalt conforming to AASHTO M 81, or an emulsified asphalt conforming to AASHTO M 140 or M 208. Cationic emulsified asphalt shall have a minimum Saybolt Furol Viscosity at 122 degrees F at the point of manufacture of 200 seconds, and a maximum Saybolt Furol Viscosity of 500 seconds.

2.3 ASPHALTIC CONCRETE

A. Mineral Aggregates
   1. Mineral aggregates for asphaltic concrete binder course and surface course shall consist of combinations of coarse aggregate, fine aggregate, and mineral filler proportioned as provided for in the specifics mix designs.

   2. Coarse aggregate is that fraction retained on the #10 sieve and shall consist of crushed gravel, crushed stone, or slag.

   3. Fine aggregate is that fraction passing the #10 sieve, and shall consist of clean, hard, durable particles of natural or manufactured sand or combinations of the two. Natural sand shall meet the requirements of AASHTO M 145 except that a maximum of 35

percent may pass the #200 sieve. Fine aggregate may contain a maximum of 2 percent coal and lignite by weight of the fine aggregate.

4. Crushed stone shall consist of clean, hard, durable fragments of rock of uniform quality, free from an excess of soft particles. The stone shall have a percent of wear, measured by AASHTO T 96, not greater than 40, and when subject to 5 cycles of the Sodium Sulfate Soundness test, AASHTO T 104, the loss shall not exceed 12 percent.

5. Crushed gravel shall consist of clean, hard, durable aggregate free from an excess of soft particles in which at least 98 percent of the particles retained on the #10 sieve have been produced form larger particles by crushing operations. Gravel shall have a percent of wear, measured by AASHTO T 96, not greater than 40.

6. Mineral aggregates shall be clean and free of deleterious material and adherent films of clay that will prevent thorough coating with asphalt materials. The fraction passing the #40 sieve shall have a plasticity index not greater than 4. For asphaltic concrete mixes, a minimum of 65 percent of total aggregate shall be produced by crushing larger particles.

7. Mineral filler shall comply with the requirements of AASHTO M 17.

8. Gradation of aggregates shall comply with the design mix set forth in the ARDOT 2014 Standard Specification for Highway Construction.

B. Asphalt cement shall conform to AASHTO M 226. Physical requirements are per Table II of AASHTO M 226, with the further provision that ductility for all grades of asphalt cement shall be a minimum of 100 cm and all grades shall have a negative spot as determined by the Spot Test. The grade to be used will be determined by the mix design.

D. Surface course shall be composed of mineral aggregates, asphalt cement, and any required additives proportioned to meet the requirements for ARDOT 1/2" (PG64-22) Surface Course.

E. Surface course shall contain not more than 60 percent limestone aggregate in the coarse mineral aggregate fraction. When limestone is the primary coarse mineral aggregate, crushed sandstone, crushed siliceous gravel, syenite, novaculite, or crushed slag shall be used as the remaining coarse mineral fraction.

2.4 MIX DESIGN

A. A special mix design prepared specifically for this project will not be required. Submit for review the mix design in use at the mixing plant for its regular supply of the mixes specified.

B. Mix designs shall be prepared by laboratory analysis in accordance with the requirements of the specifications. Mix design preparation shall comply with applicable provisions of ARDOT 404.01.

2.5 SOURCE QUALITY CONTROL

A. Contractor is responsible for quality control testing of the HMAC mixtures to be incorporated in the work prior to their placement in the work, in accordance with the General Requirements.

B. Tests shall be conducted by the mixing plant, as part of a regular quality control program. Such tests shall be of the type and at the frequency required to demonstrate that the mixing plant is producing mixtures in conformance with required design mixes.

C. If required by Owner or his designated representative, submit a copy of standing quality control program in use at the mixing plant.

D. If required by Owner or his designated representative, submit copies of testing records of tests conducted at the mixing plant on the HMAC products delivered for this project. Such tests will be ordered if Owner or his designated representative has reason to believe the HMAC mixtures supplied are not in compliance with the specifications, or if the mixtures appear to result in overly difficult placement or compaction such that specified results are not obtained. Such testing , if ordered, may include: extraction tests (ARDOT 450) and sieve analysis (AASHTO T 30) of the extracted aggregate; nuclear asphalt content gauge (ARDOT 449/449A) and sieve analysis (AASHTO T 30) of the aggregate sample obtained by ARDOT Test Method 460. Additional tests required for further evaluation of the mixture will be as needed to prove the adequacy of the mixture.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work will be performed. Conditions detrimental to timely and proper execution of this work shall be corrected. No work shall be done until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Before application of each course or surface coat, prepare the existing course to receive the new course. Such preparation may include filling sags and depressions with asphalt binder or surface course mixtures. Accomplish this work by hand, blade grader, or mechanical spreader methods. Featheredge to a smooth and even surface around the edges of these areas. Prime coat or tack coat as applicable before placing this material. Examine base course to verify that the lines and grades conform to the requirements of the Drawings and Specifications.

B. Clean loose and foreign materials.

C. Paint contact surfaces of curbing, gutters, manholes, and other structures with a thin coating of rapid curing cutback asphalt or emulsified asphalt.

3.3 INSTALLATION

A. Prime Coat
   1. Clean surface to be treated with prime coat of dust, dirt, and loose or foreign material by sweeping with mechanical brooms immediately preceding application of prime coat. Take care to clean but not loosen or dislodge embedded aggregate in base course. Remove patches of asphalt, dirt, or other material which does not form an integral part of the surface to be treated.
   2. Perform cleaning only far enough in advance of the application to ensure the surface being properly prepared at the time of application.
   3. Spray prime coat material uniformly over surface by means of mechanical pressure distributor at the rate of 0.25 gallons per square yard, or as recommended by the manufacturer for project conditions. Remove surplus material that collects in surface depressions.
   4. Allow prime coat to cure per manufacture's recommendations before application of asphalt material. NO material for a succeeding course shall be placed on a primed base course until the prime coat has cured sufficiently to prevent damage by hauling operations.
   5. Do not apply when air temperature is below 45 degrees F.
   6. Observe special precautions to ensure uniform distribution of prime coat material. Adjust and operate distributor so as to evenly distribute material. Remove excess quantities on the road surface caused by stopping or starting the distributor, by overflow, leakage, or otherwise.
   7. Apply prime coat material only at temperatures within manufacturer's recommendations.
   8. Repair prime coat that becomes damaged.

B. Surface Course construction is covered in general ARDOT Sections 407 and 410. Preparing HMAC mixture is covered in general in ARDOT Section 409. Surface course shall be constructed to the following standards.
   Minimum Density, percent of theoretical 92.0
   Maximum Moisture, percent (Roadway) 0.75
   Surface course construction shall comply with the requirements of Paragraph 3.3.C, and with the following additional requirements:
   1. Offset longitudinal joint in one layer by approximately 6-inches from the layer below. However, joint in top layer of non-parking lot paving shall be at the centerline of pavement or at lane lines. General casting back of material or hand raking material onto surface will not be permitted.
   2. Establish edge of surface course at least 500 feet ahead of spreading operation.
   3. Finished surface, when checked with a 10-foot straight edge parallel to the centerline, shall show no variation more than 1/8-inch for surface course.

3.4 PAVING THICKNESS

A. After the base course has been primed, the asphaltic concrete wearing course shall be applied in thickness as follows:
   1. Medium Duty Paving (drives): 3" thick surface course.
   2. Light Duty Paving (Parking areas): 3" thick surface course.

3.5 FIELD QUALITY CONTROL

A. Owner will be responsible for quality control testing of the completed pavement, in accordance with the General Requirements. Tests to be taken and their frequency will be determined by Owner or his designated representative. Tests may include coring for depth and laboratory density, in-place density, and straight edge for smoothness. Density of compacted mixtures shall be in accordance with AASHTO T 166.

B. If testing shows deficiencies, correct deficiencies by means satisfactory to Owner or his designated representative prior to beginning additional work. If deficiencies appear to be the result of variation from approved mix design, an inadequate mix design, or materials (as opposed to workmanship), operation will be stopped until corrections can be made at the mixture source. If deficiencies are a result of workmanship, adjust operations and equipment to achieve the specified results. If deficiencies of failing areas are discovered after paving is complete, core samples will be taken of failed area and surrounding area at contractor's expense. In deficient or failed areas, Asphaltic concrete and base course material will be removed, subgrade re-compacted and tested for proper compaction. Install base course, compact, and pave, meeting specifications and minimum thickness. Finished grades shall not be altered from original finished elevations.

3.6 ASPHALTIC PAVING PATCHING

A. Provide patching and repair of existing asphaltic concrete paving where removed for construction including complete sub-grading, application and finishing asphaltic concrete in areas as shown on drawings or as required to make a complete job.

B. Existing asphaltic concrete where cuts for new sidewalks, utilities, etc., occur due to the new construction called for shall be patched a minimum of 3" thick wearing course at parking areas, and 4" at drive areas. Base material shall be as specified in this section. Sub-base shall be compacted to a minimum of 95% of the materials maximum laboratory dry density determined in accordance with ASTM Specification D-698, the Standard Proctor procedure.

3.7 CLEANING

A. Clean surface of pavement as required of debris and loose material after compaction and before final acceptance.

B. Clean ACHM splatter or excess material from curbs, gutters, drainage structures, and other places where it has been placed and exceeds the limits of paving indicated on the Drawings.

END SECTION

SECTION 32 13 13

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. ARDOT specifications and those noted on the drawings shall supersede respective items contained in this section.

B. Related Sections:

Section 31 23 00:	Earthwork
Section 32 11 16:	Crushed Stone Base Course
Section 03 11 00:	Concrete Form Work
Section 03 21 00:	Concrete Reinforcement
Section 03 30 00:	Cast-in-Place Concrete
Section 07 92 00:	Joint Sealant

1.2 PROJECT CONDITIONS

A. Traffic Control:
Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Utilize flagmen, barricades, warning signs, and warning lights as required.

1.3 REFERENCES

A. ARDOT Standard Specifications for Highway Construction, 2014 Edition.

PART 2 PRODUCTS

2.1 MATERIALS

A. Forms:
1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
2. Use flexible spring steel forms or laminated boards to form radius bends as required.
3. Form Release Agent: Coat forms with non-staining type coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls.

C. Reinforcing Bars: Deform steel bars, ASTM A 615, Grade 40.

D. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

F. Curing Compound: FS TT-C-800, with a minimum of 17% solids content.

2.2 MIXING

A. Concrete Mix, Design and Testing: Comply with requirements of applicable Section 03 30 00 for concrete mix design, sampling and testing, and quality control.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce following properties:

C. Compressive Strength: 4,000 psi, minimum at 28 days.

D. Slump Range: 8" for concrete containing HRWR admixture(super- plasticizer); 3"-5" for other concrete.

E. Air Content: 5% to 7%.

PART 3 EXECUTION

3.1 PREPARATION

A. Surface Preparation: Remove loose material from compacted base material surface immediately before placing concrete.

B. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after the unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

3.2 CONCRETE INSTALLATION

A. Form Construction:
   1. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
   2. Check completed form work for grade and alignment to following tolerances:
   3. Top of forms not more than 1/8" in 10'-0".

4. Vertical face on longitudinal axis, not more than 1/4" in 10'-0".
5. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
6. Reinforcement: Locate, place, and support reinforcement as specified in Division 3 sections.

B. Concrete Placement:
1. Paving thicknesses are as follows:
Medium Duty Paving: 7" concrete.
Parking Areas: 5 ½" concrete.
2. Comply with requirements of Section 03 30 00 for mixing and placing concrete.
3. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall be placed around manholes or other structures until they are at the required finish elevation and alignment.
4. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement or side forms. consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
5. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hours, place construction joint.

3.3 JOINT CONSTRUCTION

A. Provide joints as shown on drawings and as specified, but in no case exceed requirements of ACI 302.1R and 316R code requirements.

B. Construction expansion, weakened-plan (contraction),and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

C. Weakened-Plan (Contraction) Joints: Provide weakened-plane(contraction) joints, sectioning concrete into areas at 12'-0" o.c. maximum each way. Construct weakened-plane joints for depth equal to at least 1/4 concrete thickness, as follows:

D. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with recommended cutting tool and finishing edges with jointer.

E. Sawed Joints: Form weakened-plane joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

F. Construction Joints:
1. Place concrete joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour, except where such placements terminate at expansion joints.
2. Construct joints using standard metal keyway-section forms.

G. Expansion Joints:
   1. Provide pre-molded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects.
   2. Locate expansion joints at 60'-0" o.c. maximum for each pavement lane.

H. Joint Fillers:
   1. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
   2. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace of clip joint filler sections together.

I. Joint Sealants:
   1. Exterior pavement joint sealants shall composed of a non-priming, pourable, self-leveling type of a coal tar modified polyurethane, or a polyurethane, sealant suitable for use in pavements and sidewalks.

3.4 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with 10`-0" straightedge. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide continuous smooth finish.

C. Work edges of slabs, back top edge of gutter, and formed joints with an edging tool, and round to 1/2" radius. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
   1. Broom finish by drawing fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide fine line texture. Inclined Slab Surfaces: Provide coarse, non-slip finish by scoring surface with stiff-bristled broom perpendicular to line traffic.

F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

G. Protect and cure finished concrete paving using acceptable moist-curing methods.

3.5 CLEANING AND ADJUSTING

A. Repair or replace broken or defective concrete, as directed.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

C. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

3.6 TESTING AND SAMPLING:

A. Slump Tests: A minimum of two slump tests shall be made each day concrete is placed with one test being made at the time test cylinders are made. Slump tests are to be made in accordance with "Method of Test for Slump of Portland Cement Concrete" (ASTM C-143-78). Where slump exceeds five inches (5") or the average 28 day strength of the three test specimens falls below the strength specified (3000 p.s.i.) for the class of concrete tested, or below proportional minimum 7 day strengths, (2,400 psi) the proportions, water content or temperature conditions shall be changed to secure the required properties, and, at the discretion of the Architect, portions of the structure containing such concrete shall be removed and replaced, or reinforced as necessary.

B. Strength Tests: Compression strength test shall be performed in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C39-81). Samples for concrete cylinders shall be made in accordance with "Method of Sampling Fresh Concrete" (ASTM C172-82), and test cylinders shall be prepared and laboratory cured in accordance with "Method of Making and Curing Concrete Compression and Flexture Test in the Field" (ASTM C31-69).

C. Cylinders: Three cylinders from the same batch shall be made for each 50 cubic yards or fraction thereof placed, but not less than three cylinders for each day of concrete operations shall be made. Location of batch as to placement on the subject shall be noted, and cylinders so designated. No tests shall be required for sidewalks. One cylinder shall be tested at 7 days and two at 28 days.

D. A minimum of 9 cylinders shall be tested for each class of concrete used on the project and the average of any three consecutive strength tests at 28 days shall be equal to or greater than the specified strength. Result of any individual strength test shall not be less than 500 p.s.i. of required fc.

E. Contractor shall bear expense of all testing by a recognized licensed engineer.

END OF SECTION

SECTION 32 16 00

WALKS & CURBS

PART 1 GENERAL

1.1 SCOPE:

A. Provide all materials, labor, equipment and related items necessary to complete the concrete walks and curbs as shown on the drawings.

1.2 RELATED SECTIONS

A. Section 32 11 16: Crushed Stone Base Course.

B. Section 32 12 16: Asphalt Paving

C. Section 32 13 13: Portland Cement Concrete Paving

D. Section 03 11 00: Concrete Form Work

E. Section 03 21 00: Concrete Reinforcement

F. Section 03 30 00: Cast-in-Place Concrete

G. Section 07 92 00: Sealants

PART 2 PRODUCTS/ /MATERIALS

2.1 WALKS & CURBS:

A. 3,500 psi at 28 days in accordance with ACI and CRSI Standards, 3,500 for curbs. Materials, testing, and placing shall be specified in Division 3. Concrete to be air entrained per Section 03 30 00. No fly ash is permitted in walks or curbs.

2.2 EXPANSION JOINTS

A. Expansion joint material shall be 1/2" pre-molded filler especially made for such use - not INSULATION or SHEATHING BOARD for all curbs and non-exposed aggregate walks and pavement.

PART 3 EXECUTION

3.1 CONCRETE WALKS

A. Concrete walks shall be of one course construction 4 inches thick, and of widths shown on the drawings. Provide 1/8" per foot crown or cross slope in the direction of drainage. All steps are to drain freely. Provide tooled joints as shown on drawings.

B. Expansion joints: Provide 1/2" transverse expansion joints, at walk junctions and intersections, at top and bottom of steps, and where walks abut curb returns, buildings, platforms or other fixed structures, or terminate at curbs. Expansion joints shall be at right angles to the slab and extend the full depth thereof. Pre-molded filler where called for shall extend to within 1/2" of the surface. Fill remaining void with sealant as specified in Section 07 92 00. Locate expansion joints in walks as shown on plans and nearly as practicable opposite those in abutting curbs, approximately 20' on center.

C. Control Joints: Provide troweled joints 1/4 of slab depth where indicated on plans.

D. Protection. Remove no forms for 24 hours after pouring concrete. Protect concrete walks and courtyards from pedestrian traffic for a period of three days after pouring.

3.2 WALKS AND CURB FINISH

A. Finish Types shall be the following:
   1. Light Broom Finish

B. Light Broom Finish:
   1. After placing concrete paving, do not work the surface further until ready for floating.
   2. Begin floating when the surface water has disappeared and when the concrete has stiffened sufficiently to permit operation of a power- driven float, or both.
   3. Consolidate the surface with power-driven floats, or by hand-floating if the area is small or inaccessible to power units.
   4. Check and level the surface plane to a tolerance not exceeding 6mm in 3 m (1/4" in 10'-0") when tested with a 3 m (10'-0") straightedge placed on the surface at not less than two different angles.
   5. Cut down high spots and fill low spots.
   6. Uniformly slope surfaces to drains where required.
   7. Immediately after leveling, re-float the surface to a uniform, smooth, granular texture as approved by the Architect.
   8. At this point, apply a light broom finish in one direction. Make sweeps uniform and continuous, keeping bristles clean after each sweep. Provide a small sample area for approval by Architect prior to finishing entire surface.

3.3 CONCRETE CURBS

A. All machine poured curbs to be shape and profile shown on Drawings.

B. Construct hand formed concrete curbs in small workable sections. Size and depth of curbs shall be generally 6" wide x 18" deep with sloped face, unless noted otherwise on Drawings.

C. Provide 1/2 inch expansion joints, with pre-molded filler cut to shape of cross section at ends of all returns at 40 foot intervals, maximum. Align with sidewalk expansion joints where curb abuts sidewalk. Fill top 1/2" of joint with sealant as specified in section 07 92 00. Provide sawn control joints at 20' o.c., max. Fill expansion joints with sealant.

D. Tamp and screed concrete as soon as placed. Remove division plates and face forms as soon as practicable; fill any honeycombed places with 1:2 mortar and give exposed surfaces same finish as specified for concrete walks.

E. Remove no forms, except face forms, for 24 hours after placing concrete. Protect against pedestrian traffic for three (3) days and against vehicular traffic for 14 days. Compact thoroughly and backfill behind curb. Place and compact fill behind curb as soon as practical.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General painted pavement markings.

B. Fire Lane Marking

C. Accessible (Handicapped) parking symbol painting.

1.2 RELATED SECTIONS

A. Construction Drawings

B. Section 32 12 16 - Asphaltic Paving

C. Section 32 13 13 - Portland Cement Concrete Paving

1.3 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 PRODUCTS

2.1 MATERIALS

A. Paint Type: Federal Highway Administration approved. Paint shall be Promar alkyd traffic marking paint, manufactured by Sherwin Williams, factory mixed, quick-drying, non-bleeding, or approved equal.

B. The following items are to be painted with the colors noted below:

Letters, Arrows & Lane Striping:	White
Handicap Symbols:	Blue & White (Refer to detail on drawings)
Guard posts/Bollards:	Color as selected or shown on plans.
Parking Stall Striping:	White
Curb @ Fire lane:	Red with 3" high white block letters "No Parking Fire Lane" every 30 feet of curb. Paint entire curb, or if there is no curb, paint 4” wide stripe with 3” high letters on edge of pavement.

PART 3 EXECUTION

3.1 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

3.2 APPLICATION

A. Apply two (2) coats of paint at manufacturer's recommended rate with total maximum of 320 lineal feet per gallon per coat with 4" wide stripe. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs, use a straightedge to ensure a uniform, clean, and straight stripe.

B. Do not apply pavement marking paint until layout, colors and placement have been verified with Architect. Allow paving to age for minimum 20 days prior to pavement markings. Sweep and clean surfaces to eliminate loose materials and dust.

C. Pavement markings to be applied in suitable weather conditions.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizing.

D. Maintenance.

1.2 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Backfill: Topsoil material.

B. Section 31 35 00 – Slope Protection and Erosion Control

1.3 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarters, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 - Contract Closeout: Procedures for submittals.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer, herbicide, and pesticide composition and application.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Material and Equipment: Transport, handle, store, and protect products.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

A. Section 01 77 00 - Contract Closeout.

B. Contractor to maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for one cutting. This shall include watering fertilizing, and weed control at regular intervals. Architect to determine if grass is well established and exhibits vigorous growth condition.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Seed Mixture as noted on Civil drawings.
   1. During certain periods of the year, Annual Rye Grass may be deleted upon approval of a local A.N.L. A. certified nursery and Architect.

2.2 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: FS O-F-241; as recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Herbicide: Type as recommended by local county agent.

E. Erosion Fabric: Curlex Blankets, manufactured by American Excelsior Company or approved alternate.

F. Stakes: Softwood lumber, chisel pointed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 4 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.4 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.5 SEEDING

A. Apply seed at a rate described in specifications or on drawings. Apply evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: Verify with a local A.N.L.A. certified nursery.

D. Do not sow immediately following rain, or when ground is too dry, or during windy periods.

E. Roll seeded area with roller not exceeding 112 lbs.

F. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

G. Apply water with a fine spray immediately after each area has been mulched. Saturate soil to a depth of 4 inches.

3.7 SEED PROTECTION

A. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.8 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas which show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

3.9 EROSION

A. If topsoil begins to erode before grass is established, redress to finish grades and re-seed.

3.10 SCHEDULE

A. As indicated on drawings, where disturbed by construction, at perimeter of building and paved areas unless sod is called for in areas shown on drawings.

END OF SECTION

SECTION 32 92 20

HYDRO-SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizing.

D. Maintenance.

1.2 RELATED SECTIONS

A. Section 31 23 00 - Excavation and Backfill: Topsoil

B. Section 32 93 00 - Trees, Plants, and Ground Cover

1.3 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarters, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 - Contract Closeout: Procedures for submittals.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, year of production, net weight, date of packaging, and location of packaging.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer, herbicide, and pesticide composition and application.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Material and Equipment: Transport, handle, store, and protect products.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

A. Section 01 77 00 - Contract Closeout.

B. Contractor to maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for one cutting. This shall include watering fertilizing, and weed control at regular intervals. Architect to determine if grass is well established and exhibits vigorous growth condition.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Seed Mixture as noted on Civil drawings.
   1. During certain periods of the year, Annual Rye Grass may be deleted upon approval of a local A.N.L. A. certified nursery and Architect.

2.2 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds.

2.3 ACCESSORIES

A. Mulching Material: Cellulose fiber mulch at a rate of 2000 lbs per acre with a maximum of 50 lbs per 100 gallons of water.
B. Fertilizer: FS O-F-241; as recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Herbicide: Type as recommended by local county agent.

E. Erosion Fabric: Curlex Blankets, manufactured by American Excelsior Company or approved alternate.

F. Stakes: Softwood lumber, chisel pointed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 4 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.3 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.4 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.
C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.5 PREPARATION OF SLURRY

A. Slurry preparation shall take place on-site.

B. Add water to tank with engine at half throttle.

C. When water level has reached agitator shaft, establish good recirculation and add seed and chemical additive.

D. Add wood pulp mulch after tank is at least one-third full of water.

E. Open engine throttle to full speed when tank is half full of water.

F. All wood pulp mulch shall be added by the time tank is 2/3 to 3/4 full.

G. Spraying shall commence immediately. If seeding is delayed 1/2 - 2 hours, add an additional 50% of seed mix. If delay is longer than 2 hours, begin with new mixture.

3.6 APPLICATION OF SLURRY

A. Spray area with uniform visible coat using green color of wood pulp as guide.

B. Apply in a sweeping motion in an arched stream, allow wood fiber to spread at required rate per acre.

C. Planting Season: Verify with a local A.N.L.A. certified nursery.

3.7 MAINTENANCE

A. When seedlings are 1-1/2" high, apply 1/2 lb. of water soluble nitrogen per 1000 sq.ft. to stimulate rapid establishment and protect against weed invasion.

B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

C. Neatly trim edges and hand clip where necessary.

D. Immediately remove clippings after mowing and trimming.

E. Water to prevent grass and soil from drying out.

F. Roll surface to remove minor depressions or irregularities.

G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

H. Immediately reseed areas which show bare spots.

I. Protect seeded areas with warning signs during maintenance period.

3.8 EROSION

A. If topsoil begins to erode before grass is established, redress to finish grades and re-seed.

3.9 SCHEDULE

A. As indicated on drawings, and where disturbed by construction in areas not scheduled for sodding or planters.

END OF SECTION

SECTION 32 92 23

SODDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil.

B. Fertilizing.

C. Sod installation.

D. Maintenance.

1.2 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Backfill: Topsoil material.

B. Section 32 92 19 - Seeding.

1.3 REFERENCES

A. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

B. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarters, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 - Contract Closeout: Procedures for submittals.

B. Operation Data: Submit for continuing Owner maintenance.
C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Sod: Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Submit sod certification for grass species and location of sod source.

C. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience.

D. Installer: Company approved by the sod producer.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Material and Equipment: Transport, handle, store, and protect products.

B. Deliver sod on pallet or in rolls. Protect exposed roots from dehydration.

C. Do not deliver more sod than can be laid within 24 hours.

1.9 PROJECT CONDITIONS

A. Section 01 31 00 - Coordination and Meetings.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Coordinate with installation of underground sprinkler system piping and watering heads.

D. Sod Installation Season: Verify with a local A.N.L. A. certified nursery or county agent.

1.10 MAINTENANCE SERVICE

A. Contractor to provide service and maintenance of sodded areas for three months from Date of Substantial Completion or until grass is well established and exhibits a vigorous growing condition for two cuttings, whichever is the longer period. Architect to determine if sod is well established and exhibits vigorous growth condition.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sod: ASPA Approved Field grown; cultivated grass sod; as noted on Civil drawings with strong fibrous root system, free of stones, burned or bare spots; containing no more than 10 weeds per 1000 sq ft.

B. Topsoil: As specified in Section 31 23 00.

C. Fertilizer: 13-13-13 Time release.

D. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.2 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

B. Wire Mesh: Interwoven hexagonal plastic mesh of 2 inch size.

2.3 HARVESTING SOD

A. Machine cut sod and load on pallets in accordance with ASPA Guidelines.

B. Cut sod in area not exceeding 1 sq yd, with minimum 1/2 inch and maximum 1 inch topsoil base.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil and eliminate uneven areas and low spots.

B. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

C. Remove foreign materials and undesirable plants and their roots. Do not bury foreign material beneath areas to be sodded.

D. Remove contaminated subsoil.

E. Scarify subsoil to a depth of 4 inches where topsoil is to be placed.

F. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.3 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod within 24 hours after harvesting to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches (300 mm) minimum. Do not stretch or overlap sod pieces.

D. Lay smooth. Align with adjoining grass areas.

E. Place top elevation of sod 1/2 inch below adjoining paving or curbs.

F. On slopes 3:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

G. Water sodded areas immediately after installation. Saturate soil to a depth of 4 inches.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller.

3.5 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod to areas which show deterioration or bare spots.

H. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

SECTION 32 93 00

TREES, PLANTS, AND GROUND COVER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of subsoil and topsoil.

B. Topsoil bedding.

C. New trees, plants, and ground cover.

D. Mulch and fertilizer.

E. Maintenance.

F. Tree Pruning.

1.2 RELATED SECTIONS

A. Section 31 23 00 - Excavation and Backfill: Placement of topsoil in preparation for the work of this Section.

B. Section 32 92 19 - Seeding

C. Section 32 92 20 - Hydroseeding

D. Section 32 92 23 - Sodding.

1.3 REFERENCES

A. ANSI Z60.1 - Nursery Stock.

B. NAA (National Arborist Association) - Pruning Standards for Shade Trees.

1.4 DEFINITIONS

A. Weeds: Any plant life not specified [or scheduled].

B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

1.5 SUBMITTALS - PROJECT CLOSEOUT

A. Section 01 77 00 - Contract Closeout: - Operation and Maintenance Data: Procedures for submittals.

B. Maintenance Data: Include cutting and trimming method; types, application frequency, and recommended coverage of fertilizer.

C. Submit list of plant life sources.

1.6 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three (3) years experience and licensed by State Plant Board.

B. Installer Qualifications: Company specializing in installing and planting the plants with five (5) years experience, approved by nursery.

C. Tree Pruner Qualifications: Company specializing in pruning trees with proof of Arborist Certification.

D. Tree Pruning: NAA - Pruning Standards for Shade Trees.

E. Maintenance Services: Performed by installer.

1.7 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture.

C. Plant Materials: Certified by state department of agriculture, Described by ASTM Z60.1, free of disease or hazardous insects.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Protect and maintain plant life until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

B. Do not install plant life when wind velocity exceeds 30 mph.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.

1.11 WARRANTY

A. Provide one (1) year warranty under provisions of Section 01 77 00.

B. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

D. Contractor shall notify owner to provide letter stating Owner will Guarantee and maintain landscaping for a period of Three (3) years from date of substantial completion per City of Bentonville, AR, requirements.

1.12 MAINTENANCE SERVICE

A. Maintain plant life immediately after placement until plants are well established and exhibit a vigorous growing condition. Continue maintenance until termination of warranty period.

B. Maintenance to include:
   1. Cultivation and weeding plant beds and tree pits.
   2. Applying herbicides for weed control in accordance with manufacturer's instructions.
   3. Remedy damage resulting from use of herbicides.
   4. Remedy damage from use of insecticides.
   5. Irrigating sufficient to saturate root system.
   6. Pruning, including removal of dead or broken branches, and treatment of pruned areas or other wounds.
   7. Disease control.
   8. Maintaining wrapping, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.
   9. Replacement of mulch.

PART 2 PRODUCTS

2.1 TREES, PLANTS, AND GROUND COVER

A. Trees, Plants, and, Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.

2.2 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.

2.3 SOIL AMENDMENT MATERIALS

A. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

B. Composted organic material; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight.

C. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

D. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.

E. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of plants.

2.4 MULCH MATERIALS

A. Mulching Material: Cedar or cypress mulch, free of growth or germination inhibiting ingredients.

2.5 ACCESSORIES

A. Stakes: Softwood lumber, pointed end or mild steel angle, galvanized, pointed end.

B. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

C. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

2.6 TOP SOIL MIX AND PLANT SOIL MIX

A. A uniform mixture of 1 part composted organic material and 3 parts topsoil by volume.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Provide analysis of imported and existing topsoil.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; pH value.

C. Submit minimum 10 oz sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination. Testing is not required if recent tests are available for imported topsoil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared subsoil are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.2 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 4 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds to same depth as plant root system and twice as wide as plant root system.

3.3 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches in seeded areas and 12” in planting beds. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.4 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2” of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.5 PLANTING

A. Place plants for best appearance for review and final orientation by Architect/Engineer.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches (150 mm) under each plant. Remove burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lay in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.6 INSTALLATION OF ACCESSORIES

A. Place tree protectors.

3.7 PLANT SUPPORT

A. Brace plants vertically with a minimum of 3 plant protector wrapped guy wires and stakes.

3.8 TREE PRUNING

A. Prune trees remove any dead or damaged limbs.

3.9 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Assurance: Field inspection and testing.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.10 MAINTENANCE

A. Neatly trim plants where necessary.

B. Immediately remove clippings after trimming.

C. Water to prevent soil from drying out.

D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

E. Apply pesticides in accordance with manufacturers instructions.

3.11 SCHEDULE - PLANT LIST

A. Refer to Civil Drawings.

END OF SECTION

SECTION 33 11 00

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site water piping and fittings including domestic waterline and fire sprinkler system waterline including valves, fire hydrants and appurtenances.

B. Connection of site water system to municipal water systems and testing.

C. Utility line Detection tape

1.2 RELATED SECTIONS

A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities

B. Local Governing Authority and Code Requirements

C. Construction Drawings

1.3 PUBLIC WORK

A. Comply with the Bentonville Water Utilities standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

1.4 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME) latest edition
   B 16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

B. American Society for Testing and Materials (ASTM) latest edition
   B 88 Seamless Copper Water Tube
   D 1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
   D 2241 Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
   D 2564 Poly(Vinyl Chloride) (PVC) Solvent Cement
   D 2672 Poly(Vinyl Chloride) (PVC) Integrally Molded Bell Ends for Solvent-Cemented Pipe Joints
   D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

D 3139	Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
F 477	Elastomeric gaskets and lubricant
F 656	Poly(Vinyl Chloride) (PVC) Cement Primer

C. American National Standards Institute (ANSI) latest edition
A21.8

D. American Water Works Association (AWWA) latest edition

C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
C105	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
C110/C153	Ductile-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
C111	Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
C151	Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
C500	Gate Valves for Water and Sewage Systems
C502	Dry-Barrel Fire Hydrants
C504	Rubber-Seated Butterfly Valves
C508	Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS
C509	Resilient-Seated Gate Valves for Water and Sewage Systems
C600	Installation of Ductile-Iron Water Mains and Appurtenances
C606	Grooved and Shouldered Joints
C651	Disinfecting Water Mains
C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

E. Underwriters Laboratories (UL) latest edition

246	Hydrants for Fire Protection Service

1.4 QUALITY ASSURANCE

A. Perform installation in accordance with applicable utility company or municipality requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Compaction testing of trench backfill shall be performed in accordance with Section 31 23 33.

D. Water distribution system pipe installed below grade and outside building shall be tested in accordance with the following procedures:
   1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and watertightness. Pressure pipeline shall be tested in accordance with Section 4 of AWWA C600. In event state or local code requires more stringent test, the more stringent shall apply.

2. Pressure Test:
   After pipe has been laid, newly laid pipe or valved section thereof shall be subjected to hydrostatic pressure of at least 1.5 times working pressure at point of testing and not less than 1.25 times working pressure at highest point along test section.
3. Leakage Test:
   Leakage test shall be conducted concurrently with pressure test. Leakage is defined as quantity of water that must be supplied into newly laid pipeline or valved section thereof to maintain pressure within 5 psi of specified test pressure after air in pipeline has been expelled and pipeline has been filled with water. Leakage shall not be measured by drop in pressure in test section over period of time.
   No pipeline installation will be accepted if leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133200}$$

   L = allowable leakage, (gallons per hour)
   S = length of pipe tested, (feet)
   D = nominal diameter of pipe, (inches)
   P = average test pressure during test, (psig)

4. Visible Leakage:
   Visible leaks shall be repaired regardless of amount of leakage measured.
5. Acceptance of Installation:
   If test of pipe laid in place discloses leakage greater than that specified, Contractor shall, at his own expense, locate leak and make repairs as necessary until leakage is within specified allowance.

   Supply water for testing at no expense to Owner.

1.5 SUBMITTALS

A. Product Data: Provide submittal data on pipe materials, pipe fittings, hydrants, valves, and accessories.
B. Manufacturer's Certificate: Certify that products meet or exceed state or local requirements.
C. Furnish 1 copy of results of leakage test and pressure test to the Owner or his designated representative and utility company upon completion of water distribution backfilling operations.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities

PART 2 PRODUCTS

2.1 PIPE

A. Pipe sizes less than 3-in. that are installed below grade and outside building shall comply with one or combination of following:
   1. Water piping buried **beyond 5 feet** of building perimeter:
      a. Seamless Copper Tubing: Type "K" soft copper to comply with ASTM B 88 and installed with wrought copper (95-5 Tin Antimony solder joint) fittings in accordance with ASME B 16.22.
      b. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall conform to ASTM D 2241 with SDR 21 rating and shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 1784 material classification. Pipe joints using solvent cement shall be integrally molded bell ends in accordance with ASTM D 2672. Cement primer shall comply with ASTM F656 and solvent cement shall comply with ASTM D2564.
   2. Water Piping buried **within 5 feet** of building
      a. Copper Pipe: ASTM B 42, hard drawn.
         i. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
         ii. Joints: AWA A5.8, BCuP silver braze.

B. Pipe sizes 3-in. and larger that are installed below grade and outside building shall comply with one or a combination of the following:
   1. Ductile Iron Water Pipe: In accordance with AWWA C151, pressure class 150 or greater. Fittings shall be either mechanical joint, push-on joint or locked-joint complying with AWWA C110 or AWWA C153. Elastomeric gaskets and lubricant shall comply with ASTM F477 or AWWA C111.
   2. Polyvinyl Chloride (PVC) Water Pipe: Pipe shall meet the requirements of AWWA C900, rated DR 18 (Class 150). Pipe shall be continually marked as required for smaller pipes. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3139. Elastomeric gaskets and lubricant shall comply with ASTM F477 or AWWA C111.
   3. Seamless Copper Tubing: Shall match existing copper pipe material, type, and construction. Material shall comply with ASTM B 88.

2.2 GATE VALVES - 3 inch and Larger

A. Manufacturers:
   Resilient Seat Gate Valves by American-Darling, Mueller or approved equal.

B. AWWA C500, Ductile Iron body, non-rising stem with square nut, resilient seat, mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

2.3 BALL VALVES - Smaller than 3 inch

A. Manufacturers:
Mueller Oriseal or approved equal.

B. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

2.4 BUTTERFLY VALVES - 3 inch and larger.

A. AWWA C504, Ductile Iron body, bronze or heat treated ductile iron disc, resilient replaceable seat, mechanical joint ends, infinite position lever handle.

2.5 CHECK VALVES - 3 inch and larger.

A. AWWA C 508, Ductile Iron body, mechanical joint ends

2.6 POST INDICATOR VALVES - From 4-in. to 14-in.

A. F-5760 and/or NFPA 13 or local codes, whichever is more stringent.

2.7 BACKFLOW PREVENTORS - Comply with applicable local code and/or NFPA 24

2.8 FIRE HYDRANTS

A. Fire Hydrants: Type as required by utility company and as shown on Construction Drawings.

B. Hydrant Extensions: Fabricate in multiples of 6-in. with rod and coupling to increase barrel length.

C. Hose and Steamer Connections: Match size and thread as required by applicable utility company, with two hose nozzles and one pumper nozzle.

D. Finish: Apply primer and 2 coats of enamel or special coating of color as required by applicable utility company.

2.9 DETECTION TAPE

A. Provide metallic detection tape installed approximately 12” above pipe installed on site outside of building footprint. Tape shall be continuous and be marked indicating water line.

2.10 ACCESSORIES

A. Thrust Blocking: Place 2,500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil. Refer to applicable detail on construction drawings for requirements.

B. Locked or restrained joint fittings can be installed in lieu of thrust blocking requirements where vertical changes in direction are required if approved by governing authority.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe ends and remove burrs prior to assembly.

B. Remove scale and dirt, on inside and outside, prior to assembly.

C. Prepare and properly align pipe for connections to equipment.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33.

3.4 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.

B. Install pipe and fittings in accordance with AWWA C600.

C. Install pipe to allow for expansion and contraction without stressing pipe or joints as specified by pipe manufacturer.

D. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

E. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions that cause the least interference with the operation of existing pipeline and in compliance with local utility company requirements.

F. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

G. Establish elevations of buried piping in accordance with Section 31 23 33.

H. Backfill trench in accordance with Section 31 23 33

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves as indicated on Construction Drawings and supported on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies where and as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete thrust blocking. Place a minimum of 6 cu. ft of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Exercise care when backfilling and compacting so proper vertical position will not be altered.

3.6 DISINFECTION OF WATER PIPING SYSTEM

A. Disinfect distribution system with chlorine before acceptance for domestic operation. Amount of chlorine shall be such as to provide dosage of not less than 50 parts per million. Thoroughly flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours, system shall be flushed with clean water until residual chlorine content is not greater than 1.0 part per million. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriologically test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.

3.7 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventor if required and water meter with by-pass valves and sand strainer.

END SECTION

SECTION 33 31 13

SANITARY SEWER SYSTEMS

PART 1 GENERAL

1. 1 SECTION INCLUDES

A. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.

B. Connection of site and/or building sanitary sewer system to municipal sanitary sewer systems.

1.2 RELATED REQUIREMENTS

A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities

B. Section 33 39 00 – Sanitary and Storm Sewer Manhole Structures

C. Local governing authority and code requirements

D. Construction Drawings

1.3 PUBLIC WORK

A. Comply with the Bentonville Water Utility standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition

A 74	Cast Iron Soil Pipe and Fittings
A 746	Ductile Iron Gravity Sewer Pipe
C 12	Practice for Installing Vitrified Clay Pipe Lines
C 14	Concrete Sewer, Storm Drain, and Culvert Pipe
C 76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 425	Compression Joints for Vitrified Clay Pipe and Fittings
C 443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C 564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
C 700	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
D 1785	Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
D 3034	Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
F 477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F 949	Polyvinyl Chloride (PVC) Pipe and Fittings

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
   M 252 Corrugated Polyethylene Drainage Tubing
   M 294 Polyvinyl Chloride (PVC) Pipe and Fittings

C. American Water Works Association (AWWA) latest edition
   C111 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings

1.5 QUALITY ASSURANCE

A. Compaction testing will be performed in accordance Section 31 23 33

B. Test sanitary sewer pipe system installed below grade and outside building in accordance with the following procedures:

1. Perform testing of manhole construction, pipe materials, joints, or other materials incorporated into construction of sanitary sewer system to determine leakage and watertightness. In event state or local code requires more stringent test, the more stringent shall apply.

2. Manhole Testing:
   The Owner or his designated representative or Governing Agency shall determine method of testing set forth below. Method selected will be determined by depth of each manhole, groundwater level, concrete honeycombing, or other conditions which make selected test suitable for determining physical condition and watertightness of manhole.

   2.1 Manhole Exfiltration Testing:
   Incoming and outgoing sewer lines shall be plugged and manhole filled with water up to top of poured concrete or above highest precast barrel joint. Manhole fails if water loss exceeds maximum allowable shown below:

Depth of Manhole	Maximum Allowable Water Loss
0 - 8-ft	1-in. over 5 minutes
greater than 8-ft	1/8 gal/vertical ft over 5 minutes

   2.2 Manhole Vacuum Testing:
   Test shall be performed with suitable apparatus made for such purpose and shall draw vacuum of 10-in. of Mercury (Hg). Test passes if vacuum remains at 10-in. of Hg or drops to not less than 9-in. of Hg in 1 min.

3. Flexible Pipe Deflection Testing:

   3.1 Allowable Deflection:
   Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.

3.2 Mandrel:
Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with less arms will be rejected as not sufficiently accurate. Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-in. maximum. Mandrel and necessary equipment for mandrel test shall be provided by Contractor.

3.3 Procedure:
Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled and compacted. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of the Owner or his designated representative or Governing Agency. Repaired section shall be retested.

3.4 Mandrel O.D. (outside diameter):
Outside diameter of mandrel shall be set according to the following table:

Nominal Diameter, in.	Mandrel O.D., in.
4	3.60
6	5.40
8	7.12
10	8.80
12	10.44
15	12.90
18	15.30

3.5 Contractor's Warranty:
The Owner or his designated representative or Governing Agency reserves the right to mandrel test flexible pipe sewer line before acceptance, and also prior to expiration of first year of operation. If previously accepted line fails mandrel test performed during first year of operation, defects must be corrected at Contractor's expense.

4. Air Testing of Gravity Sewers:

4.1 Procedure:

4.1.1 Plug pipe outlets with suitable test plugs and brace each plug securely.
4.1.2 Pipe air supply to pipeline to be tested in such manner that air supply may be shut off, pressure observed, and air pressure released from pipe without workmen entering manhole.

4.1.3 Add air slowly to portion of pipe under test until internal pressure of line is raised to approximately 4 psig, but less than 5 psig.

4.1.4 Shut air supply off and allow at least 2 minutes for air pressure to stabilize.

4.1.5 When pressure has stabilized and is at or above starting test pressure of 3.5 psi, start test.

4.1.6 Determine time in seconds with stopwatch for pressure to fall 0.5 psig so that pressure at end of time is at or above 3.0 psig.

4.1.7 Compare observed time with minimum allowable times in chart on following page for pass/fail determination.

1 Nominal Pipe Diameter (inches)	2 Minimum Time (min:sec.)	3 Length for Minimum Time (feet)	4 Time for Longer Length (sec.)	SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

4.2 Safety Precautions:
Low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, line is over pressurized or plugs are installed improperly. It is extremely important that various plugs be installed so as to prevent the sudden expulsion of poorly inflated plug. As example of hazard, force of 250-lb

is exerted on 8-in. plug by internal pressure of 5 psi. Observe following safety precautions:

4.2.1 No person shall be allowed in manholes during test or when plugged pipe is under pressure.

4.2.2 Gauges, air piping manifolds, and valves shall be located at top of ground.

4.2.3 Install and brace plugs securely.

4.2.4 Do not over pressurize lines.

4.3 Groundwater Elevation:
If pipeline to be tested is below groundwater level, starting test pressure shall be increased by 0.433 psi for each foot groundwater level is above invert of sewer pipe. In no case shall starting test pressure exceed 9.0 psig.

4.4 Acceptance of Installation:
No gravity sewer or manhole will be accepted that does not comply with minimum requirements of tests described in herein.

4.5 Test Equipment:
Necessary equipment to perform air test in accordance with Specifications shall be provided by Contractor. Test gauge shall preferably have incremental division of 0.10 psi and have accuracy of at least 0.04 psi. In no case shall test gauge be used which has incremental divisions of greater than 0.25 psi. Gauge shall be of sufficient size in order to determine this accuracy.

4.6 Furnish 1 copy of gravity sewer and manhole test results to the Owner or his designated representative and Governing Agency upon completion of gravity sewer system backfilling operations.

1.5 SUBMITTALS

A. Product Data: Provide data of pipe materials, pipe fittings, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.7 PROJECT CONDITIONS

A. Coordinate work with sanitary sewer connections to structures and to municipal sewer system.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Sanitary sewer piping, buried **beyond 5 feet** of building
   1. PVC Pipe: ASTM D 2665 or ASTM D 3034
      a. Fittings: PVC
      b. Joints: Solvent welded, with ASTM D 2564 solvent cement.

B. Sanitary sewer piping, buried within 5 feet of building
   1. PVC Pipe: ASTM D 2665 or ASTM D 3034
      a. Fittings: PVC
      b. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS

A. Lid and Frame: Heavy Duty cast iron construction, as manufactured by Mueller or approved equal. Lid Design: Closed Lid.

B. Shaft Construction: Cast Iron shaft of internal diameter as indicated on Construction Drawings with 2500 psi concrete collar matching finish grade.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify items specified in other sections are properly sized and located.

B. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate trench and place bedding material in accordance with Section 31 23 33.

3.4 INSTALLATION – PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C 12, ASTM C 14, ASTM D 2321, or manufacturer's instructions and local requirements.

B. Lay pipe to slope gradients noted on Construction Drawings.

C. Install pipe on bedding in accordance with Section 31 23 33.

D. Refer to Section 31 23 33 for trenching requirements. Do not displace or damage pipe when backfilling and compacting.

E. Refer to Section 33 39 00 for manhole requirements.

F. Connect to building sanitary sewer outlet and municipal sewer system as indicated on Construction Drawings.

3.5 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Provide concrete encasement as indicated on Construction Drawings after sanitary sewer pipe and fittings have been installed to proper elevations.

END OF SECTION

SECTION 33 39 00

SANITARY AND STORM SEWER MANHOLE STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Monolithic, cast in place concrete manhole barrel and either monolithic concrete or masonry transition to lid frame.

B. Modular precast concrete manhole barrel with tongue-and-groove joints and either precast concrete or masonry transition to lid frame.

C. Precast polyethylene manhole assemblies.

D. Preparation and installation of lid frame, covers, anchorage, and accessories.

1.2 RELATED SECTIONS

A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities

B. Section 33 41 00 - Storm Sewer Systems

C. Section 33 31 13 - Sanitary Sewer Systems

D. Section 32 13 13 – Portland Cement Concrete Paving

E. Local governing authority and code requirements

F. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition

A 48	Gray Iron Castings
C 55	Concrete Building Brick
C 478	Precast Reinforced Concrete Manhole Sections
C 923	Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
D 1248	Polyethylene Plastics Molding and Extrusion Materials

B. International Masonry Industry All-Weather Council (IMIAC) latest edition Recommended Practices and Guide Specification for Cold Weather Masonry Construction

1.4 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings regarding manhole locations, elevations, piping with sizes, locations, and elevations of structure penetrations.

B. Product Data: Provide data for manhole covers, manhole steps, component construction, features, configuration, and dimensions.

1.5 PUBLIC WORK

A. Comply with the Bentonville Water Utility standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for public utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manhole Barrel: Nonreinforced cast-in-place concrete in accordance with Section 03 30 00.
   1. Cast-in-place manholes shall be not less than 4'-0" inside diameter and constructed of 3500 psi concrete.
   2. Forms shall be made of steel sheets accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.
   3. Concrete shall be deposited in evenly distributed layers of about 18 in., with each layer vibrated to bond to preceding layer.

B. Manhole Barrel: Reinforced precast concrete in accordance with ASTM C 478 with gaskets in accordance with ASTM C 923.

   Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated, but never less than 4'-0" inside diameter.

C. Manhole Barrel: Precast polyethylene in accordance with ASTM D 1248. Manholes shall be manufactured with factory-molded steps. Nominal cylinder internal diameter shall be 48-in. and shall be designed to accept concrete filled polyethylene manhole lids and standard cast iron frames with lid or grate. Manholes shall have a compressive strength which meets ASTM D 2412 standards. Acceptable Manufacturers: Advanced Drainage Systems (ADS) or approved equal.

E. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-in. deep shall be repaired using Class "D" mortar.

2.2 COMPONENTS

A. Lid and Frame: Lid and frame shall comply with ASTM A 48, Class 35B heavy duty cast iron construction, machined flat bearing surface, removable lid, closed or open as indicated on Construction Drawings with sealing gasket and manufactured by Neenah Foundry Company or approved equal.

B. Base Pad: Cast-in-place concrete as specified in Section 03 30 00.

2.3 CONFIGURATION

A. Barrel Construction: Concentric barrel with eccentric cone top section.

B. Shape: Cylindrical

C. Clear Inside Dimensions: 48-in. diameter or as indicated on Construction Drawings.

D. Design Depth: As indicated on Construction Drawings.

E. Clear Lid Opening: 22-in. diameter minimum

F. Pipe Entry: Provide openings as indicated on Construction Drawings

G. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with non-shrinking grout.

H. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify items specified by other Sections are properly sized and located.

B. Verify that items associated with structures are in proper location and ready for connection to other work and/or structure construction.

C. Verify that the excavation for manholes and other structures are correct.

3.2 PREPARATION

Coordinate placement pipe connections to structure as indicated on Construction Drawings.

3.3 PLACING PRECAST MANHOLE BARREL SECTIONS

A. Place slab foundation to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
   1. After completion of slab foundation, first joint of manhole barrel shall be lowered into position, grooved end first, and set level and plumb on concrete slab. Align and adjust to proper grade prior to placing and forming invert which shall be poured immediately after setting of first section of manhole barrel.
   2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place "Ram-nek", or equivalent joint sealing material on tongue end. Lower next section into position, and remove excess sealing material from interior of structure. Add additional material on exterior of joint, if necessary, for a completely watertight joint.

END OF SECTION

SECTION 33 41 00

STORM SEWER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site storm sewer drainage piping, fittings, accessories, and bedding.

B. Connection of site and/or building storm water drainage system to municipal storm sewers.

1.2 RELATED REQUIREMENTS

A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities

B. Section 33 44 00 – Storm Drainage Structures

C. Local governing authority and code requirements

D. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO) latest edition
   - M 36 Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains
   - M 198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
   - M 252 Corrugated Polyethylene Drainage Tubing
   - M 274 Pure Aluminum Type 2 Coated Corrugated Steel Culverts and Underdrains
   - M 294 Polyvinyl Chloride (PVC) Pipe and Fittings

B. American Society for Testing and Materials (ASTM) latest edition
   - A 760 Spiral Rib Metal Pipe (Type 1 R)
   - C 14 Concrete Sewer, Storm Drain, and Culvert Pipe
   - C 76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
   - C 443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
   - D 2321 Underground Installation of Flexible Thermoplastic Sewer Pipe
   - D 3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
   - F 794 Polyvinyl Chloride (PVC) Pipe and Fittings

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.6 PROJECT CONDITIONS

A. Coordinate work with storm sewer connections to structures and to municipal storm sewer system.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS AND ACCESSORIES

A. Reinforced Concrete Pipe: Comply with requirements of ASTM C 76, Class III unless another class type is indicated on Construction Drawings, installed with flexible plastic, bitumen gaskets at joints. Gaskets shall comply with AASHTO M 198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.

B. Corrugated Steel Pipe: Galvanized, aluminized, or bituminous coated as specified on Construction Drawings. Only permitted when specifically indicated on Construction Drawings and shall comply with requirements of ASTM A 760; 16 gauge unless another gauge is indicated on Construction Drawings. Install with matching band connectors. Install sleeve gaskets in accordance with pipe manufacturer's recommendations. Corrugated steel pipe may be round pipe, arch pipe, or slotted drain pipe as indicated on Construction Drawings. Slotted drain pipe shall have 1.75-in. wide drain waterway openings and 6-in. minimum height drain guide.

C. Spiral Rib Metal Pipe Type 1R: Galvanized, aluminized, or bituminous coated as specified on Construction Drawings. Only permitted when specifically indicated on Construction Drawings. Pipe ends shall be re-corrugated and installed with semi-corrugated Hugger-type bands and "O" ring gaskets in accordance with pipe manufacturer's installation requirements. Spiral Rib metal pipe must comply with ASTM A 760 Type 1R. Acceptable manufacturer: CONTECH, INC. "ULTRA FLO or ULTRA FLO II", Caldwell Culvert Co. "Smooth Rib", or approved alternate.

D. Corrugated Polyvinyl Chloride smooth interior storm sewer pipe and fittings shall comply with ASTM F949-93A, meet all requirements of AASHTO M304-91 (H-20 Loading) and be marked with manufacturers name, pipe size, cell classification and ASTM F 949 classification. Only permitted when specifically indicated on Construction Drawings. Pipe must be installed per manufacturers installation requirements. Acceptable manufacturer: CONTECH, INC. “D-2000” PVC storm sewer pipe or approved alternate.

E. Corrugated Polyethylene Pipe (CPP) Smooth Interior: Only permitted when specifically indicated on Construction Drawings and shall conform with AASHTO Designation M 252 and M 294. Pipe must be installed in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. "ADS N-12", HANCOR, INC. "Hi-Q", or approved alternate.

F. Polyvinyl Chloride (PVC) large diameter closed profile gravity sewer pipe, UNI-B-9: Only permitted when specifically indicated on Construction Drawings. Pipe and fittings shall comply with ASTM F 794. Pipe must be installed in accordance with pipe manufacturer's installation guidelines. Acceptable manufacturer: Carlon "Vylon H.C." or approved alternate.

G. Polyvinyl Chloride (PVC) 8-in. through 30-in. diameter, smooth interior, open profile gravity sewer pipe. Only permitted when specifically indicated on Construction Drawings. Pipe and fittings shall comply with ASTM F 794 and Uni-Bell UNI-B-9. Pipe must be installed in accordance with pipe manufacturer's installation guidelines. Acceptable manufacturer: Extrusion Technologies, Inc. "Ultra-Rib" or approved alternate.

H. Corrugated Polyvinyl Chloride smooth interior sanitary sewer pipe and fittings shall comply with ASTM F 949-93A and be marked with manufacturers name, pipe size, cell classification and ASTM F 949 classification. Pipe must be installed per manufacturer’s installation requirements. Only permitted when specifically indicated on Construction Drawings. Acceptable manufacturer: CONTECH, INC. “A-2000” PVC sanitary sewer pipe or approved alternate.

I. Polyvinyl Chloride Storm Sewer Truss Pipe and fittings shall comply with ASTM D 2680 and be marked with manufacturers name, pipe size, cell classification and ASTM D 2680 classification. Only permitted when specifically indicated on Construction Drawings. Acceptable manufacturer: CONTECH, INC. “Contech PVC Storm Sewer Truss Pipe” or approved alternate.

2.2 INLETS, CATCH BASINS AND JUNCTION BOXES

A. Lid and frame per details shown on Construction Drawings.

B. Structure construction shall be in accordance with details shown on Construction Drawings and in accordance with Section 33 44 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify items specified in other sections are properly sized and located.

B. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C 14, ASTM D 2321, or manufacturer's instructions and state or local requirements.

B. Install pipe on bedding in accordance with Section 31 23 33.

C. Lay pipe to slope gradients noted on Construction Drawings.

D. Refer to Section 31 23 33 for trenching requirements. Do not displace or damage pipe when backfilling and compacting.

3.5 INSTALLATION - CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad in accordance with section 03 30 00, with provision for storm sewer pipe to be placed at proper elevation.

C. Form and place cast-in-place concrete walls, sleeved at proper elevation to receive storm sewer pipe in accordance with section 03 30 00 and details shown on Construction Drawings.

D. Form and place cast-in-place top of structure in accordance with details shown on Construction Drawings.

END OF SECTION