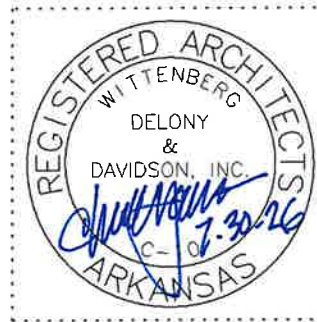


WDD ARCHITECTS
5050 NORTHSHORE LN
NORTH LITTLE ROCK, AR 72118

WDD
ARCHITECTS



JONESBORO FIELD OFFICE RECONSTRUCTION
ARKANSAS GAME AND FISH COMMISSION

JONESBORO, ARKANSAS

WDD PROJECT NO. 25-065

ISSUE SET

JULY 30, 2026

WITTENBERG, DELONY & DAVIDSON, INC.
5050 NORTHSHORE LN, NORTH LITTLE ROCK, ARKANSAS 72118
(501) 376-6681

Mechanical-Electrical Engineers
PETTIT & PETTIT CONSULTING ENGINEERS, INC.
201 E MARKHAM, STE 400, LITTLE ROCK, ARKANSAS 72201

Structural Engineers
ENGINEERING CONSULTANTS, INC.
401 W CAPITOL AVE, STE 305, LITTLE ROCK, ARKANSAS 72205

Civil Engineers
ASSOCIATED ENGINEERING AND TESTING, LLC
103 SOUTH CHURCH STREET, JONESBORO, ARKANSAS 72403

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JONESBORO FIELD OFFICE RECONSTRUCTION
ARKANSAS GAME AND FISH COMMISSION
JONESBORO, ARKANSAS

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- 1.01 Sealed bids for Reconstruction of the Jonesboro Field Office will be received until 2:00 PM, Local Time on Tuesday, September 08, 2026, in the Auditorium of Arkansas Game and Fish Commission at 2 Natural Resources Dr., Little Rock, AR 72211, and then will be publicly opened and read aloud.
- A. Telephones and private office space **WILL NOT** be available for use by bidders.
- 1.02 A mandatory pre-bid conference will be held at 10:00 AM on Monday, August 24, 2026, at 600 E. Lawson Rd., Jonesboro, AR 72404 . General Contractors failing to attend this meeting or arriving late for this meeting will forfeit the right to submit a bid. Subcontractors are strongly encouraged to attend this meeting but are not required to attend. **The Owner reserves the right to schedule additional meetings.**
- 1.03 The work includes Site Preparation and Improvements, General Construction, Mechanical Work, Plumbing Work and Electrical Work, all to be let under one prime contract.
- 1.04 **Bid Security:** A cashier's check or acceptable bidder's bond payable to the Owner in an amount not less than 5% of the base bid submitted must accompany each bid as a guarantee that, if awarded the contract, the bidder will promptly enter into a contract and execute such bonds as may be required. If a Bid Bond is provided, the Bond must be signed by an authorized agent of the Bonding Company and the agent's power of attorney must be submitted with the Bid Bond.
- 1.05 Copies of drawings, specification and other proposed contract documents are on file and are open to inspection at the following places.
- Wittenberg, Delony & Davidson, Inc.
Southern Reprographics Plan Room
- 1.06 Prime Bidders may obtain up to one (1) full-sized set of Bidding Documents from Southern Reprographics, Inc., 901 West 7th, Little Rock, Arkansas 72201, Tel: 501-372-4011, upon deposit by means of a credit/debit card, on account, or check in the amount of **\$100** per set, payable to Wittenberg, Delony & Davidson, Inc. Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return paper Bidding Documents in good condition within ten (10) days after receipt of Bids. A Bidder receiving a Contract award may retain paper Bidding Documents, and the Bidder's deposit will be refunded. Additional sets or partial sets of Bidding Documents, including addenda, may be obtained for the actual cost of printing, shipping and handling, and will be non-refundable. Prime Bidders may also obtain Bidding Documents in electronic format through Southern Reprographics at www.sriplanroom.com for a non-refundable fee as pre-determined by level of access.

- 1.07 Bidders, sub-bidders, material suppliers and other interested parties are encouraged to obtain complete sets of Bid Documents from the Architect. Complete sets of Bid Documents should always be used in preparing bids. Neither the Owner nor Architect assumes responsibility for errors in bidding or misinterpretations of Bid Documents resulting from the use of incomplete sets of Bid Documents. The documents obtained through the Architect are considered the official version and take precedence if any discrepancies occur. The use of incomplete or inaccurate Bid Documents does not relieve the bidder of the obligation to perform all work related to his bid as detailed in a complete set of Bid Documents.
- 1.08 This project is funded as part of the American Recovery and Reinvestment Act (ARRA) and is subject to the ARRA-Buy American Act, Construction Materials and 48 CFR Part 52 relating to Solicitation Provisions and Contract Clauses) Iron, steel and other manufactured goods used for a project for the construction, alteration, maintenance or repair of a public work must be produced or manufactured in the United States.
- 1.09 All bidders shall conform to the requirements of Arkansas Code Annotated 17-25-101, Arkansas State Licensing Law for Contractors.
- 1.10 The Owner reserves the right to waive any formalities in, or to reject any or all bids.
- 1.11 No bidder may withdraw his bid within 60 days after the date of the opening thereof.
- 1.12 Each bid must be submitted in a sealed envelope bearing, on the outside, the name of the bidder, their Arkansas Contractor License number, their address and the project name.

END OF DOCUMENT 00 11 16

PART 1 - GENERAL

1.01 DESCRIPTION OF BID

- A. Base Bid: Work includes Site Preparation and Improvements, General Construction, Mechanical Work and Electrical Work, as shown on the Drawings and described herein, all to be let under one prime contract.
 - 1. Reference AIA Document A701™ - 2018 Instructions to Bidders as may be applicable to competitively bid projects.
- B. Bid Documents: Bidders, sub-bidders, material suppliers and other interested parties are encouraged to obtain complete sets of Bid Documents from the Architect. Complete sets of Bid Documents should always be used in preparing bids. Neither the Owner nor Architect assumes responsibility for errors in bidding or misinterpretations of Bid Documents resulting from the use of incomplete sets of Bid Documents. The documents obtained through the Architect are considered the official version and take precedence if any discrepancies occur. The use of incomplete or inaccurate Bid Documents does not relieve the bidder of the obligation to perform all work related to his bid as detailed in a complete set of Bid Documents.

1.02 EXAMINATION OF PREMISES

- A. Before submitting his bid, Contractor will be held to have examined the premises and satisfied himself as to existing conditions under which he will be obligated to operate, or that will in any manner affect Work under this contract.
- B. Bidder must inform himself fully of conditions relating to construction of project and employment of labor. Failure to do so does not relieve successful bidder of his obligation to furnish material and labor necessary to carry out provisions of his contract. Insofar as possible Contractor, in carrying out his Work, must employ such methods or means to avoid any interruption of or interference with Work of any other Contract.

1.03 CONTRACTOR'S LICENSE

- A. Parties bidding on this Work must comply with all requirements and regulations of Contractor's License Law of the State of Arkansas, as set forth in Arkansas Code Annotated § 17-25-101 et. seq.

1.04 BID FORMS

- A. Bids must be submitted on forms included in Document 00 41 13 of Project Manual. Submit one copy.

- B. Place Bid Documents in a sealed envelope and clearly label with words "**Bid Documents**". Show job name and number, name of bidder, Contractor's License Number, date and time of opening.
- C. In case of discrepancy between written amounts shown by bidder and amounts in numerical figures on bid form, the amount written out rather than amount in numerical figures shall govern.

1.05 INTERPRETATIONS

- A. No interpretation of plans, specifications or other bid documents will be made orally to any bidder. Requests for interpretation or clarification of Bid Documents must be made in writing addressed to **Wittenberg, Delony & Davidson, Inc.,**
ATTN: Gordon Duckworth, AIA, duck@wddarchitects.com.
 - 1. TO BE GIVEN CONSIDERATION, REQUESTS FOR INTERPRETATION MUST BE RECEIVED AT LEAST FIVE (5) WORKING DAYS PRIOR TO DATE FIXED FOR OPENING OF BIDS.**
- B. Interpretations and supplemental information will be issued in the form of written addenda issued to prospective prime contract bidders. **ADDENDA WILL NOT BE ISSUED WITHIN THREE (3) WORKING DAYS (72 hours) PRIOR TO DATE FIXED FOR OPENING OF BIDS.** Failure of bidder to receive any addendum shall not relieve bidder from obligation under his bid as submitted. All addenda so issued shall become part of Contract Documents.
- C. Should an error, inconsistency or omission be found in the Bid Documents after the Bid Opening, the Contractor will be deemed to have prepared his bid based upon the more costly or complex way of performing the Work or in accordance with the more stringent requirements.
- D. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications is to have the same effect as if shown or mentioned in both.
- E. Precedence **IS NOT** given to the Specifications over the Drawings or to Large Scale Drawings over Smaller Scale Drawings. All drawings and all specifications are complimentary and shall be viewed collectively when interpreting the Design Intent for the Project. The Architect is the sole judge and interpreter of Design Intent and his decision will be final and binding upon the General Contractor.

1.06 BID GUARANTY

- A. Bid must be accompanied by bid guaranty of not less than five percent (5%) of the amount of bid, and at option of bidder may be cashiers check or bid bond secured by surety company and made payable to order of Owner. Bid guaranty shall insure execution of contract and furnishing of performance and payment bond or bonds by successful bidder.

1. If a Bid Bond is provided, the Bond must be signed by an authorized agent of the Bonding Company and the agent's power of attorney must be submitted with the Bid Bond.

1.07 OPENING OF BIDS

- A. At time and place fixed for opening of bids, every bid received within time fixed for receiving bids will be opened and publicly read aloud, unless the bid contains irregularities in statutory requirements. Failure of bidder to respond to statutory requirements listed on the bid form may result in the bid being declared non-responsive and the bid will not be read nor will the bid be considered for the purposes of awarding a Contract.

1.08 WITHDRAWAL OF BIDS PRIOR TO BID OPENING

- A. Bids may be withdrawn on written or electronic request dispatched by bidder in time for delivery in normal course of business prior to time fixed for opening; provided, that written confirmation of any electronic withdrawal over signature of bidder is placed in the mail and postmarked prior to time set for bid opening. Negligence on the part of bidder in preparing his bid confers no right of withdrawal or modification of his bid after such bid has been opened.

1.09 QUALIFICATIONS OF BIDDER

- A. Owner may make such investigations as he deems necessary to determine ability of bidder to perform Work, and bidder shall furnish to Owner all such information and data for this purpose Owner may request. Owner reserves right to reject bid of any bidder who has previously failed to perform properly, or to complete on time, contracts of similar nature; who is not in position to perform contract, or who has habitually and without just cause neglected payment of bills or otherwise disregarded obligations to subcontractors, materialmen, or employees.

1.10 POWER OF ATTORNEY

- A. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

1.11 LAWS AND REGULATIONS

- A. Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and rules and regulations of authorities having jurisdiction over construction of project shall apply to contract throughout, and they will be deemed to be included in contract the same as though written out in full.

1.12 BID FORMALITIES AND REJECTION OF BIDS

- A. Owner reserves right to waive any formalities in a bid or to reject any or all bids.

1.13 CONDITIONAL BIDS

- A. Conditional bids will not be considered.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00 21 13

WDD Project No.: 25-065

00 41 13-1

LIST OF SUBCONTRACTORS

I, the undersigned General Contractor, certify that proposals from the following subcontractors were used in the preparation of my proposal. I agree that if I am the successful bidder, and if following subcontractors are approved, I will not enter into contracts with others for these divisions of the Work without written approval from Architect and Owner.

NAME:

LICENSE NO.

ELECTRICAL: _____

MECHANICAL: _____

PLUMBING: _____

ROOFING AND SHEET METAL: _____

Bidder understands that Owner reserves right to reject any or all bids and to waive any formalities in the bidding. Bidder agrees bid shall be good and may not be withdrawn for period of sixty (60) days after scheduled closing time for receiving bids.

Upon receipt of written notice of acceptance of bid, Bidder will execute formal contract within ten (10) days and deliver Surety Bond or Bonds as required by Document 00 61 13.

Bid security attached in amount of 5% of base bid is to become property of Owner in event above contract and bond are not executed within time set forth above as liquidated damages and additional expenses to Owner.

By: _____
(Typed Name)

Date: _____

(Signature)

Contractor License No. _____

(Title)

(Business Address)

(Seal - If bid is by a Corporation)

END OF DOCUMENT 00 41 13

WITTENBERG, DELONY & DAVIDSON, INC.

5050 Northshore Lane, North Little Rock, Arkansas 72118 Telephone: 501-376-6681 FAX: 501-376-0231

BID TABULATION FOR : Jonesboro Field Office Reconstruction
Arkansas Game and Fish Commission
Jonesboro, Arkansas

PROJECT NO. : 25-065

BIDS RECEIVED: September 08, 2026 at 2:00 PM

[illegible]

BID CERTIFICATION: I hereby certify that the bids as tabulated above are correct as received and read aloud.

Signature: _____
Chad Young, AIA, Principal | Project Manager

Date: February 08, 2022

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AGREEMENT FORM - STIPULATED SUM (SINGLE PRIME CONTRACT)**PART 1 - GENERAL****1.01 AUTHORITY**

- A. The Agreement Form and Exhibit A, Insurance and Bonds, are an integral part of all sections of Project Manual. Their contents and provisions shall be carefully noted in performance of Work. Include this Agreement Form and Exhibit A in the bid documents for all building construction and renovation projects.
- B. The Agreement Form is the legal instrument which is typically signed by an owner and a contractor subsequent to contract award. A legally binding contract is actually created when accepted, without qualification, the Contractor's bid. However it is this Agreement Form, which when subsequently signed by the parties, formalizes the Contract and confirms the Contractor's intention to be bound by its provisions.

1.02 GOVERNING STANDARD DOCUMENT

- A. "Standard Form of Agreement Between Owner and Contractor", AIA Document A101 - 2017 of American Institute of Architects, 2017 Edition, Articles 1 through 9 inclusive, and AIA Document A101 - 2017 Exhibit A is hereby referenced and incorporated into these specifications and is to be used as the General Conditions for this contract.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION (Not Applicable)**

END OF DOCUMENT 00 52 13

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PART 1 - GENERAL

1.01 CONTRACTOR'S GUARANTY BOND

- A. Contractor shall furnish "Performance and Payment Bond" in amount equal to 100% of contract price, as security for faithful performance of this contract and for payment of all indebtedness for labor and materials furnished or performed in connection with this contract. Bond shall be written by surety company which has qualified and is authorized to do business in the State of Arkansas and must be executed by a resident or nonresident agent who is licensed by the Insurance Commissioner to represent surety company executing said bond and filing with said bond, his power of attorney as his authority. Mere countersigning of a bond will not be sufficient. Bond shall be written in favor of Owner, and executed pursuant to terms of Arkansas Code Annotated §18-44-501 et seq., §18-44-503 et seq., §19-4-1401 et seq., and §22-9-401 et seq. The Surety guarantees that the Principal shall comply with Ark. Code Ann. §22-9-301 et seq. by payment and full compliance with all prevailing hourly wage contract provisions where the contract amount exceeds the amount provided by law. An original and two copies of bond must be furnished, with power of attorney attached to each. Bond must not be dated prior to date of the contract. Contractor shall file (not record) the original with the Clerk in the Circuit Court of the County in which Work to be performed is located. Contractor to pay all expenses incident the filing of bond. Remaining two copies should be certified by the Clerk to evidence filing of original, and these two copies submitted to Architect.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00 61 13

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PART 1 - GENERAL

1.01 AUTHORITY

- A. General Conditions and Supplementary Conditions are an integral part of all sections of Project Manual. Their contents and provisions shall be carefully noted in performance of Work.

1.02 GOVERNING STANDARD DOCUMENT

- A. American Institute of Architects AIA Document A201 - 2017 Edition, General Conditions of the Contract for Construction, Articles 1 through 15 inclusive, is hereby referenced and incorporated into these specifications and is to be used as the General Conditions for this contract.

1.03 AMENDED PROVISIONS

- A. Where any article or articles of above AIA General Conditions are supplemented by Supplementary Conditions, provisions of such articles shall remain in effect and supplementary provisions shall be considered as added thereto. Where any such article or part of such article is amended, voided or changed by Supplementary Conditions, provisions not specifically so amended, voided or changed shall remain in full effect. Where provisions of Supplementary Conditions are at variance or conflict with provisions of the AIA General Conditions, Supplementary Conditions shall govern. AIA General Conditions and Supplementary Conditions apply to all Work in every Division or Section of these Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00 72 13

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PART 1 - GENERAL

1.01 REFERENCE DOCUMENT

- A. These Supplementary Conditions are included as a part of the contract documents for this project to amend the provisions of the "General Conditions of the Contract for Construction", Document A201 of the American Institute of Architects, 2017 Edition, as required for this project. Reference herein to articles of the General Conditions refer to said Document A201.

1.02 PARAGRAPH 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

- A. Add subparagraph 3.3.4 as follows:

"3.3.4 Contractor (1) shall review any specified construction or installation procedure (including those recommended by manufacturers); (2) shall advise the Architect (a) if the specified procedure deviates from good construction practice, (b) if following the procedure will affect any warranties, including the Contractor's general warranty, or (c) of any objections the contractor may have to the procedure; and (3) to propose any alternative procedure which the Contractor will warrant."

1.03 PARAGRAPH 3.4 LABOR AND MATERIALS

- A. Add Subparagraphs 3.4.4 as follows:

"3.4.4 All contractors and subcontractors engaged in the Owner/Contractor Agreement shall conform to the labor laws of the State in which Work is to be performed and the various acts amendatory and supplementary thereto; and to all other laws, ordinances and legal requirements applicable thereto."

1.04 PARAGRAPH 3.5 WARRANTY

- A. Add subparagraph 3.5.3 as follows:

"3.5.3 The Contractor shall guarantee and warrant his and his subcontractor's work and materials (including the materials and work of suppliers of the Contract and his subcontractors) for a period of one year from the date of Substantial Completion. This Warranty shall be for a longer period on certain items if so designated in the Specifications. The foregoing one-year guaranty and warranty shall not in any way limit, restrict or affect the liability of the Contractor, or his subcontractors, for indemnity as provided for in this Contract, nor shall it in any way shorten the period of limitation fixed by law for the filing of any action against the Contractor for enforcement of the or breach of any provision of the contract documents. Should the Contractor elect to use any of the equipment in

the building during the construction period, he shall make arrangements with the subcontractor or supplier of the equipment for any extension of warranty of that equipment made necessary by such use. The Warranty period for such equipment to the Owner shall not be reduced by the use of equipment by the Contractor".

1.05 PARAGRAPH 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Add the following to subparagraph 3.12.5.1:

"3.12.5.1 Incomplete or poorly prepared shop drawings or other submittals will be returned to the Contractor to be revised or redrawn prior to resubmittal. The Contractor will hold the Architect and Owner harmless against claims for losses or injury caused by errors or omissions in the shop drawings or other submittals for the Work made by the Contractor, a subcontractor, any lower tier subcontractor, manufacturer, supplier or distributor."

B. Delete subparagraph 3.12.8 and substitute the following:

"3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect of such deviations in a separate writing or by submitting a separate written request for change at the time of submittal and the Architect has given written approval to the specific 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."

1.06 PARAGRAPH 4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

A. Add sub-subparagraph 4.2.4.1 as follows:

"4.2.4.1 Any direct communications between the Owner and the Contractor; or between the Contractor or Sub-contractors and the Architect's Consulting Engineers that affect the performance or administration of the Contract shall be made or confirmed in writing, with copies to the Architect, and any such communications that represent a modification of the Contract requirements will be documented appropriately. Any communications among the Architect and Subcontractors shall be confirmed in writing to the Contractor."

1.07 PARAGRAPH 7.2 CHANGE ORDERS

A. Delete subparagraph 7.2.1 and substitute the following:

"7.2.1 All requests for changes, additions or deductions, shall be submitted in a complete itemized breakdown acceptable to the Architect."

- 7.2.2 Wherein unit prices are stated in the contract, submit itemized break down showing each unit price and relative quantities.
- 7.2.3 The contractor shall present an itemized accounting together with appropriate supporting data for the purposes of considering additions or deductions. Supporting data shall include but is not limited to the following:
- .1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and worker or workmen's compensation insurance;
 - .2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
 - .3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
 - .4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
 - .5 additional costs of supervision and field office personnel directly attributable to the change.
 - .6 the value of all such additions and deductions shall then be computed as set forth in Paragraph 7.2.5.
- 7.2.4 The burden of proof of cost rests upon the Contractor. Contractor agrees that Owner or Owner's Representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and granting of such cost.
- 7.2.5 Compute requests for changes be they additions or deductions as follows:
- .1 For work performed by the Contractor:

Net cost of material and delivery	a	
State Sales Tax	b	
Net Placing cost	c	
W.C. Insurance Premium and FICA Tax	d	_____
		a + b + c + d
Overhead and Profit, shall not exceed 12% x (a + b + c + d)	e	_____
Allowable Bond Premium	f	_____
TOTAL COST		(a + b + c + d) + e + f
 - .2 Credit for work omitted shall be computed as outlined in 7.2.5.1 "a through e" except the contractor's share of overhead and profit is 7%.
 - .3 For work performed by Subcontractors:
Subcontractors shall compute their work as outlined in 7.2.5.1 "a through e".
To the cost of that portion of the work (change) that is performed by the subcontractor, the general contractor shall add an overhead and profit change of five (5%) percent plus the allowable bond premium.

1.08 PARAGRAPH 9.3 APPLICATIONS FOR PAYMENT

- A. Delete subparagraph 9.3.1 and substitute the following:

"9.3.1 The Contractor shall present to the Architect an application for payment on or before the twenty-fifth day of each calendar month. These periodical estimates for partial payment shall be submitted on forms, prepared at the Contractor's expense and conforming to AIA Document G702. An original and a requested number of copies of such estimate shall be tendered to the Architect."

1. Each application for payment shall be accompanied by a revised Construction Schedule. Failure to provide the revised Construction Schedule may cause a delay in processing payment applications. Any areas of the Construction Schedule that are delayed from the previous schedule shall be highlighted for the Architects attention and a detailed explanation of the reason for the delay shall accompany the revised schedule.

1.09 PARAGRAPH 9.6 PROGRESS PAYMENTS

A. Delete subparagraph 9.6.1 and substitute the following:

"9.6.1 Retainage: No later than the 10th day of each calendar month, the Owner will make partial payment to the Contractor, but the Owner will retain 5% of the amount of each payment. Retaining 5% of each payment will continue until final completion and acceptance of all work covered by the contract. However, the Architect may upon approval by the Owner, at any time after 50% of the Contract Work has been completed and based on satisfactory workmanship, and progress has been attained, including written consent of surety, recommend that any of the remaining partial payments be stopped. The retainage will be paid to the Contractor after completion of the Contract for Construction and after the Contractor has submitted all Project Record Documents, Maintenance Manuals, Warranties and Guarantees (Close-Out Documents). No retainage shall be held on materials properly stored at the site or in the Contractor's bonded or insured warehouse if certificates of insurance or bond and invoices are provided."

9.6.1.1 Progress payments will be made for work completed or for materials delivered and properly stored, in accordance with subparagraph 9.6.1, through the Contract Construction Period. No payments will be made after the Contract Construction Period has expired until Final Payment, unless an extension of the Contract Time has been granted. In which case, an additional progress payment will be made for work performed during the extension time period only."

1.10 PARAGRAPH 9.8 SUBSTANTIAL COMPLETION

A. Add the following sub-subparagraphs 9.8.3.1 thru 9.8.3.3 as follows:

"9.8.3.1 If the Architect or any of the Architect's Consultants determines that the Work has still not reached Substantial Completion a second list of deficiencies will be issued to the Contractor.

9.8.3.2 Any additional inspections by the Architect or the Architect's Consultants to determine Substantial Completion will be considered additional services and will be billed directly to the Owner.

- 9.8.3.3 The Contractor will reimburse the Owner for expenses related to these additional services, or, the Owner may choose to withhold money from Progress Payment(s) or from retainage as reimbursement for additional services."

1.11 PARAGRAPH 9.10 FINAL COMPLETION AND FINAL PAYMENT

A. Add sub-subparagraphs 9.10.1.1 thru 9.10.1.4 as follows:

- "9.10.1.1 If the Architect or any of the Architect's Consultants determines that the Work has not reached Final Completion a list of deficiencies will be issued to the Contractor.
- 9.10.1.2 Any additional inspections by the Architect or the Architect's Consultants to determine Final Completion will be considered additional services and will be billed directly to the Owner.
- 9.10.1.3 The Contractor will reimburse the Owner for expenses related to these additional services, or, the Owner may choose to withhold money from Final Payment or from retainage as reimbursement for additional services.
- 9.10.1.4 Before issuance of the final certificate, the Contractor shall obtain in writing from the bonding company approval of such payment. No certificate issued nor payment made to the Contractor, nor partial or entire use or occupancy of the Contract Work by the Owner, shall be an acceptance of any work or materials not in accordance with this contract."
- 9.10.1.5 Final payment will not be made until all project closeout documents are received from the Contractor and a release from the Contractor's Surety Company is received.

1.12 PARAGRAPH 11.1 CONTRACTOR'S INSURANCE AND BONDS

A. Delete subparagraph 11.1.2 and substitute the following:

- "11.1.2 Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the work until date of final payment and termination of any coverage required to be maintained after final payment. The insurance required shall be written for not less than the following, or greater if required by law:
- .1 Workers' Compensation:
- | | |
|---------------------------|------------------------------------|
| (a) State: | Statutory |
| (b) Applicable Federal: | Statutory |
| (c) Employers' Liability: | Per Accident: \$100,000 |
| | Disease, Policy Limit: \$500,000 |
| | Disease, Each Employee: \$100,000. |
- .2 Commercial General Liability (including premises-operations); independent contractors protective; products and completed operations) as follows:
- (a) Coverage should apply at each work site. Limits required as follows:
- | | | |
|------------------------|--------------|-------------|
| (1) General Aggregate: | Per Project: | \$2,000,000 |
| Completed Operations: | Aggregate: | \$1,000,000 |
| Personal Injury: | | \$1,000,000 |

- Each Occurrence Limit: \$1,000,000
 - (2) Products and Completed Operations to be maintained for one year after final payment.
 - (3) Property Damage Liability Insurance will provide X, C, or U coverage as applicable.
- (b) Comprehensive General Liability. Coverage provided will be on the Comprehensive General Liability form with the Broad Form General Liability Endorsement. Limits provided as follows:
 - (1) Combined Single Limit: \$1,000,000 each occurrence;
\$2,000,000 aggregate limit
 - (2) Products and Completed Operations to be maintained for one year after final payment.
 - (3) Property Damage Liability Insurance will provide X, C, or U coverage as applicable.
 - (4) Contractual Liability:
 - Bodily Injury: Combined Single Limit
 - Property Damage: \$1,000,000 Each Occurrence
 - (5) Personal Injury, with Employment Exclusion deleted:
 - Combined Single Limit
 - \$1,000,000 Each Occurrence
 - (6) Bodily Injury and Property Damage (Combined Single Limit) (any auto, including Owned, Hired and Non-Owned Autos):
 - Bodily Injury: Combined Single Limit
 - Property Damage: \$1,000,000 Each Occurrence"
 - (7) Umbrella Liability: \$5,000,000

B. Add sub-subparagraph 11.1.2.1 as follows:

"11.1.2.1 The performance-payment bond shall be in compliance with the laws of the State in which the Work is to be performed and as stipulated in Document 00 61 13, Performance and Payment Bond, of these specifications."

C. Add sub-subparagraphs 11.1.3.1 and 11.1.3.2 as follows:

"11.1.3.1 The Contractor shall furnish one copy of each certificate of insurance herein required for each copy of the agreement which shall specifically set forth evidence of all coverage required by subparagraphs 11.1.1 and 11.1.2. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage of limits."

"11.1.3.2 The Contractor shall not commence work under this contract until he has obtained all insurance with responsible insurance companies satisfactory to the Owner required under this article, and such insurance has been accepted by the Owner. Nothing in this article shall create any obligation on the part of the Architect to see that the specified insurance is maintained."

D. Add subparagraph 11.1.5 as follows:

"11.1.5 All Subcontractors shall be required to maintain contractors liability insurance the same as required to be maintained by the Prime Contractor as specified in 11.1.1 and the limits of liability shall be not less than those required to be maintained by the Prime Contractor unless their operations are covered to the specified limits by the insurance maintained by the Prime Contractor."

1.13 PARAGRAPH 11.2 OWNER'S INSURANCE

A. Delete subparagraph 11.2.1 and substitute the following:

"11.2.1 The Contractor shall procure and maintain during the term of this contract, Owner's Protective Liability Insurance with an endorsement to the policy to include as additional insured, the Architect, with limits not less than \$1,000,000 each occurrence and \$2,000,000 in the aggregate for property damage liability."

B. Add subparagraph 11.2.2.1 as follows:

"11.2.2.1 Contractor shall procure and maintain during the life of this contract **Builder's Risk** or Course of Construction (COC) Insurance, or installation Floater Insurance, and any extended coverage which shall cover damage for the project."

1.14 PARAGRAPH 15.1 CLAIMS

A. Refer to sub-paragraph 15.1.5, Claims for Additional Time and add the following sub-paragraph 15.1.6.3 as follows:

"15.1.6.3 In order for a claim for additional time due to adverse weather conditions to be considered valid, the Contractor must show that adverse weather conditions beyond those normally expected have occurred. For claims related specifically to "Rain Days" the following table of normal rain days will be employed to determine if the Contractor is entitled to a time extension. A "Rain Day" is defined as a 24 hour period in which 1/100" (.01) of rain or more falls and is recorded by the National Weather Service or other official reporting service in the immediate vicinity of the project. Extensions of time will be granted if the number of officially reported "Rain Days" is greater than normal during a given month. Claims for additional time must be submitted with the Contractor's monthly payment application for review. Failure to make timely and proper request for additional time will result in no time extension being allowed.

Average Days with 1/100" of Precipitation or More: Northeast Arkansas

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9	8	11	11	11	9	9	8	8	8	9	9

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00 73 00

PART 1 - GENERAL

1.01 EXCAVATION SAFETY PROCEDURES

- A. In accordance with Arkansas Code Annotated § 22-9-212 et. seq., the Contractor shall include a separate pay item for trench or excavation safety systems for any trench or excavation which equals or exceeds five (5) feet in depth and this pay item shall be a part of the base bid.
- B. The Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR 1926, Subpart P - Excavations (07-01-2021 Edition), is hereby referenced and incorporated into this Project Manual and must be complied with at all times.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00 73 19.13

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PART 1 - GENERAL

1.01 CONTRACT BASIS

- A. Work is based upon conditions at site, Project Manual, contract Drawings for WDD Project No. 25-065, all addenda issued and the Contract executed between Owner and Contractor.

1.02 OWNER

- A. Wherever term "Owner" or "Owners" is used in the Contract Documents it refers to the Arkansas Game and Fish Commission. All papers required to be delivered to Owner shall be delivered to Jill Curtis, Administrative Project Manager | Construction, 2 Natural Resources Drive, Little Rock, AR 72205.

1.03 ARCHITECT

- A. Wherever term "Architect" or "Architects" is used in the Contract Documents it refers to **Wittenberg, Delony & Davidson, Inc., 5050 Northshore Ln, North Little Rock, Arkansas 72118.**

1.04 TIME FOR COMPLETION

- A. Time for substantial completion of all Work under this Contract is **240** consecutive calendar days from date of written notice to proceed.

1.05 LIQUIDATED DAMAGES

- A. It is understood and mutually agreed, by and between Contractor and Owner, that date of beginning and time for completion of Work are essential conditions of the contract; and it is further mutually understood and agreed that Contractor shall commence Work embraced in this contract on date specified in Written Notice to Proceed and substantially complete Work within **240** consecutive calendar days. Contractor agrees to prosecute regularly, diligently, and uninterruptedly said Work at rate of progress as will complete Work within time specified. It is expressly understood and agreed, by and between Contractor and Owner, that time for completion of Work described is reasonable time for completion of same, taking into consideration average climatic range and usual industrial conditions prevailing in this locality. If Contractor neglects, fails or refuses to complete work within time specified, or within any proper extension granted by Owner, then Contractor does hereby agree, as a consideration for awarding of this contract, to pay Owner the amount of **\$500** per day, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that Contractor is in default after time stipulated in contract for completing Work. Said amount is fixed and agreed upon by and between Contractor and Owner to be the amount of damages which Owner would sustain.

1.05 RESPONSIBILITIES OF CONTRACTOR

- A. Except as otherwise specifically stated in the contract, Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, taxes legally collectible because of the Work and all other services and facilities of any nature necessary to execute Work as shown and/or specified under the contract and deliver it complete in every respect within specified time.
- B. If, during the course of construction of this project, the Contractor discovers errors, inconsistencies or omissions in the Contract Documents, the Contractor will report them to the Architect who will issue written instructions to the Contractor. If the Contractor performs Work knowing there is an error, inconsistency or omission in the Contract Documents without giving notice to the Architect or receiving written instruction from the Architect, the Contractor assumes responsibility for the Work and will bear all costs associated with the performance or correction of the Work.

1.06 COORDINATION OF WORK

- A. General Contractor to give special attention for coordination of work by various trades to provide uniform and symmetrical layout and spacing of exposed components which affect the finished architectural design and appearance. Where spacing and related locations are not specifically shown on the drawings, or where in doubt, Contractor's Superintendent shall consult Architect's Representative prior to installation of that part of the Work. Location of electrical and telephone outlets shall be verified with Architect prior to installation.

1.07 CONSTRUCTION DRAWINGS AND SPECIFICATIONS

- A. General Contractor may procure hard copy contract drawings and specification project manuals, to include shipping, at cost, for use in constructing Work. General Contractor shall supply all contract drawings and specifications to his subcontractors or material suppliers. Additional sets or partial sets of Bidding Documents (including addenda) requested by General Contractor, will be furnished for actual cost of printing, handling and shipping costs at General Contractor's expense. Bidding Documents may also be obtained in electronic format through Southern Reprographics at www.sriplanroom.com for a non-refundable fee as pre-determined by level of access. All official digital electronic documentation shall be distributed by Southern Reprographics.

1.08 DEFINITION

- A. The word "Provide", as used throughout these specifications, means furnish and install.

1.09 REFERENCE STANDARDS

- A. Except as otherwise noted, references throughout Project Manual to Codes, Federal Specifications, ASTM Standards, Association or Industry Specifications and other published standards, are to latest edition or publication of such standards.

1.10 PERMITS

- A. Utilizing the contract documents (Project Manual and Drawings) prepared by the Architect and his Consultants, along with information provided by the Owner or his Consultants, the Contractor is responsible for securing permits required to successfully complete the project. This responsibility includes payment for the permit and coordination of all submittals.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00

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PART 1 - GENERAL**1.01 DESCRIPTION OF REQUIREMENTS**

- A. Definitions and Explanations: Requirements of work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof will be issued at a later time.
- B. Cash allowances stipulated in specifications for this project shall not be made a part of any subcontract agreement by Contractor until materials, work and/or services stipulated have been selected by Owner or Architect. For allowances for materials and installation under a subcontract, Architect will issue supplemental specifications to Contractor to receive a minimum of three (3) subcontract bids for work under the allowance unless instructed otherwise by the Architect.

1.02 SCHEDULE OF ALLOWANCES

	<u>Section</u>	<u>Amount</u>
A. Testing and Inspecting Services	01 45 23	\$2,500
B. Signage - Interior	10 14 00	\$2,000

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION 01 21 00

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PART 1 - GENERAL**1.01 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project meetings

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section.

1.03 DEFINITIONS

- A. **RFI - Request for Information/Interpretation:** Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATION SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Reference is made to CSI Form 1.5A as an example. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract

1.05 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submissions.
 - 5. Progress meetings.
 - 6. Pre-installation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems

1.06 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
 - 2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closer methodology, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.07 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. **RFI Forms:** AIA Document G716 Software-generated form with substantially the same content as indicated above, acceptable to Architect. Contractor's option to use this form.

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI.
RFIs received by Architect after 1:00 PM will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submissions.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submissions.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. **RFI Log:** Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Reference is made to CSI Log Form 13.2B as an option.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.08 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after Notice to Proceed.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Working hours.
 - o. Library's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. **All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.**

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submissions.
 - 4) Status of documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of proposal requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS - Not Applicable -

PART 3 - EXECUTION - Not Applicable -

END OF SECTION 01 31 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Make submittals required by Contract Documents; revise and resubmit as necessary to establish compliance with specified requirements. Submittals which are received from sources other than through the General Contractor's office will be returned by the Architect without action. Submit at least one original of manufacturer's product literature. The remainder of the number of copies required for submittal may be reproductions of manufacturer's literature. **FAX submittals, poor quality reproductions or illegible submittals will not be accepted.**
- B. Contractor's submittal of (and Architect's review of) shop drawings, product data or samples which relate to work not complying with requirements of Contract Documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section.

1.03 QUALITY ASSURANCES

- A. Coordination of Submittals: Prior to each submittal, carefully review and coordinate all aspects of each item being submitted. By affixing Contractor's approval stamp to each submittal, certify that coordination has been performed.
- B. Verify that each item and submittal for it conform in all respects with specified requirements.
- C. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.

1.04 TIMING OF SUBMITTALS

- A. General: Make submittals far enough in advance of scheduled dates of installation to provide required time for reviews, securing necessary approvals, possible revision and resubmittal, placing orders and securing delivery.
- B. Owner will not bear costs of delays due to late submittals.

1.05 COORDINATION AND SEQUENCING

- A. Coordinate preparation and processing of submittals with performance of work so that work will not be delayed by submittals.
- B. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of Architect's review with another.

1.06 SUBMITTAL FORMAT AND TRANSMISSION

- A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the architect.
- B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents. **Bookmark individual submittals exceeding 20 pages, and those with multiple products and systems integrated into a single submission.**
- C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied.
- D. E-mail electronic submittal documents smaller than 5MB in size to e-mail addresses as directed by the architect.
- E. Provide electronic documents over 5MB through an electronic FTP file sharing system. Confirm that the electronic FTP file sharing system can be accessed from the architect's computer network. The Contractor is responsible for setting up, providing, and maintaining the electronic FTP file sharing system for the construction contract period of performance.
- F. Provide hard copies of submittals when requested by the architect. Up to 3 additional hard copies of any submittal may be requested at the discretion of the architect, at no additional cost to the owner.

PART 2 - PRODUCTS

2.01 PROGRESS SCHEDULE

- A. Within 7 days after Notice to Proceed, submit to Architect a bar-chart type progress schedule indicating time bar for each trade or operation of work to be performed. Time bar shall demonstrate planned work, properly sequenced and intermeshed, for expeditious completion of Work. Identify phases if required.

- B. Distribute progress schedule including all updates to Architect, Owner, subcontractor, suppliers, fabricators, and others with need-to-know schedule compliance requirements. Post copy in field office.

2.02 SCHEDULE OF VALUES

- A. Immediately after execution of the Contract Documents, Contractor shall submit for approval a Schedule of Values totaling the amount of the Contract.

2.03 LIST OF SUBCONTRACTORS

- A. Immediately after execution of the Contract Documents, Contractor shall submit for approval a listing of all subcontractors to be used for the project stating portions of Work to be performed, address and telephone number of firm, and contact at firm familiar with project.
- B. If all subcontractors have not been determined, submit a partial listing with regular updates indicating newly added subcontractors.

2.04 SUBSTITUTION REQUESTS

- A. Products specified herein establish a quality standard for comparison by manufacturers of similar products. Products of other manufacturers may be substituted for those specified herein on an "Approved Equal" basis. DO NOT propose the substitution of products that do not meet or exceed the quality standards established by the specified product. Products proposed as equivalent MUST be submitted through the General Contractor for review by the Architect after the Contract for Construction is awarded. **DO NOT request approval of products prior to the awarding of the contract.**
- B. Requests for substitution will be reviewed when extensive revisions to contract documents are not required and changes are in keeping with general intent of Contract Documents; when timely, fully documented and properly submitted; and when one or more of following conditions is satisfied, all as judged by Architect/Engineer. Otherwise, requests will be returned without action except to record non-compliance with these requirements.
 - 1. Where request is directly related to an "or equal" clause or other language of same effect in Contract Documents.
 - 2. Where required product, material or method cannot be provided within Contract Time, but not as a result of Contractor's failure to pursue the Work promptly or to coordinate various activities properly.
 - 3. Where required product, material or method cannot be provided in a manner which is compatible with other materials of the Work, or cannot be properly coordinated therewith, or cannot be warranted as required, or cannot be used without adversely affecting Owner's insurance coverage on completed work, or will encounter other substantial non-compliance items which are not possible to otherwise overcome except by making requested substitution, which Contractor thereby certified to overcome such non-compatibility, non-coordination, non-

warranty, non-insurable or other non-compliance as claimed.

4. Where required product, material or method cannot receive required approval by a governing authority, and requested substitution can be so approved.
- C. **SUBSTITUTIONS REQUESTS MUST BE SUBMITTED WITHIN 45 DAYS AFTER THE DATE OF THE NOTICE TO PROCEED.** Substitution requests received after that time will be returned and the Contractor will be required to provide the product specified, except in the following instances:
1. Unavailability of product, material or method, not due to the Contractor's failure to pursue the work promptly or to coordinate various activities properly.
 2. Where a specified product or material contains a hazardous material, as defined in 40 CFR 261 and as defined by applicable state and local regulations and of which the Owner and Architect refuse to approve for use, based on Contractor furnished information.
- D. Submit request for substitutions in writing using the Substitution Request form found at the end of this Section. **This is the only form that will be accepted.**
- E. Submit 3 copies of substitution request, fully identified for product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Include manufacturer's product data/drawings, description of installation methods, material samples where applicable, complete color and finish selection cards or samples, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitutions will result in overall work equal-to-or-better-than work originally indicated. **Proposed substitutions shall meet or exceed specified warranty requirements, to include for both materiality and prescribed installation methods.**
- F. Failure to provide the requested data and samples within the specified time frame will be grounds for rejection as a comparable product.
- G. Do not incorporate substitutions into Shop Drawings until they have been reviewed by the Architect and written permission has been issued to make the proposed substitution a part of the contract.
- H. Under no circumstances shall Architect's review of any such substitution relieve Contractor from timely, full and proper performance of Work.
- I. In the event that the substitution of a product by the General Contractor necessitates the redrawing, redesign, modification or other change to the Contract Documents, the General Contractor will bear all associated costs of these changes.

2.05 REQUEST FOR SUPPLEMENTARY INFORMATION

- A. Make timely requests of Architect for additional information required in planning and production of Work.
- B. File requests in ample time to permit appropriate action by all parties involved and avoid delay in performance of Work.
- C. Owner will not bear costs for delays due to Contractor's failure to request information in a timely manner.

2.06 SHOP DRAWINGS

- A. Provide newly-prepared information, on reproducible sheet formats, with graphic information at accurate scale (except as otherwise indicated), with name of preparer indicated (firm name). Do not duplicate and submit Architect's construction drawings as shop drawings. Show dimensions and notes which are based on field measurement. Identify materials and products in work shown. Indicate compliance with standards, and special coordination requirements. **DIGITAL SUBMISSIONS ARE ALLOWED.**
- B. Shop drawings must bear Contractor's approval stamp. This approval stamp certifies that the Contractor has reviewed the shop drawings, product data, samples or similar submittals for conformance with the Contract Documents. All deviations will be noted in writing and highlighted on the submittal for Architect's review. The Architect is not responsible for errors, omissions or deviations in the shop drawings, product data, samples or similar submittals by the Contractor.
- C. Submittals are reviewed by the Architect for design intent only. The Contractor is responsible for verification of dimensional requirements, compliance with contract documents and local codes, quantities and coordination of all affected trades.
- D. Under no circumstances shall Architect's review of shop drawings or submittals relieve Contractor from timely, full and proper performance of Work in accordance with the Contract Documents.
- E. **Contract Documents (including all drawings, specifications, addenda and supplemental information) will not be made available in any digital format or on any other reproducible media to Prime Bidders or Sub-bidders before the award of a Contract nor will they be made available to the Contractor or Sub-contractors after the award of a Contract. Prime Bidders may obtain Bidding Documents in electronic or paper format through Southern Reprographics at www.sriplanroom.com for a non-refundable fee as pre-determined by level of access.**
- F. CAD files will be available to the successful Contractor or Sub-contractors with a release letter or per AIA Document C106™ - 2013 Digital Data Licensing Agreement, after the award of a Contract.

2.07 PRODUCT DATA

- A. Collect required data into one submittal for each unit of work or system; mark each copy to show which choices and options are applicable to project AND WHICH ARE AVAILABLE FOR SELECTION BY THE ARCHITECT WITHOUT ADDITIONAL COST. NO PAYMENT WILL BE MADE FOR ADDITIONAL COST OF ANY CHOICES OR OPTIONS SUBMITTED BY THE CONTRACTOR FOR SELECTION BY THE ARCHITECT AND NOT CLEARLY SHOWN AS NOT AVAILABLE WITHIN THE CONTRACT.
- B. Include manufacturer's standard published recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements.
- C. Maintain one set of product data (for each submission) at project site, available for reference by Architect and others.
- D. Do not submit product data until compliance with requirements of contract documents has been confirmed by Contractor.
- E. Copies:
 - 1. Submit 3 paper copies of product data for Architect's review for items specified in various specification sections, **unless digital submission.**
 - 2. Three paper copies required for mechanical and electrical data, **unless digital submission.**
- F. Installer's Copy: Do not proceed with installation of materials, products or systems until final authorized copy of applicable product data is in possession of installer.
- G. **Material Safety Data Sheet (MSDS):** MSDS provides basic information on a material or chemical product. A MSDS describes the properties and potential hazards of the material, how to use it safely, and what to do in an emergency. DO NOT PROVIDE WITHIN A SHOP DRAWING SUBMISSION UNLESS SPECIFICALLY REQUESTED BY THE DESIGN PROFESSIONAL. MSDS information shall be kept on file with the contractor and subcontractors for reference. Refer to OSHA MSDS Rules for clarification at website: <https://msdsauthoring.com/msds-safety-data-sheet-chemicals-osh-msds-rules>.

2.08 SAMPLES

- A. Unless precise color and pattern is specified in Contract Documents, submit accurate color and pattern charts or actual material samples to Architect for selection. Refer to pertinent sections of specifications for detailed submission requirements. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected, and describe or identify variations between units of each set.

- B. Make all submissions affecting color selection within sufficient time to allow selection without causing delay in Work.
- C. Submit items requiring color selection or verification AS ONE SUBMISSION to facilitate coordination of all colors at one time. Interior items may be submitted separately from exterior items.
- D. Provide full set of optional samples where Architect's selection is required. DO NOT INCLUDE OPTIONS REQUIRING ADDITIONAL COST.
- E. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by Architect. Architect will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of Contractor.
- F. Submit 3 sets of samples in final submittal.
 - 1. Furnish two sets to Architect and assemble one set on site. When all samples are on site, Owner and Architect are to review. Contractor shall provide job samples indicating finished color selections for any and all items requiring finish color for project.
 - 2. Quality Control Set: Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons by Architect and Owner. Written approval from Owner is required before the work is begun for any finish requiring color review.

2.09 STRUCTURAL SUBMITTALS

- A. Structural submittals, where required, include shop drawings, design calculations, diagrams, illustrations, schedules, performance charts, nomenclature charts, samples, brochures and other data prepared by the Contractor or any subcontractor, manufacturer, supplier, fabricator, or distributor and which illustrate some portion of the Project directly related to the structural design of the project.
- B. Contractor shall make all submittals in advance of installation or construction to allow sufficient time for review.
- C. Work requiring shop drawings, whether called for by the Contract Documents or requested by the Contractor, shall not commence until the submission has been reviewed by the Architect/Structural Engineer. Work may commence if the Contractor verifies the accuracy of the Architect/Structural Engineer's corrections and notations and complies with them without exception and without requesting change in Contract Sum or Contract Time.

PART 3 - EXECUTION

3.01 SUBMITTAL PREPARATION

- A. Permanently mark each submittal to identify project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking.
- B. Indicate project, date, "To: "; "From: "; names of subcontractors, suppliers, manufacturers, required references, category and type of submittal, purpose, description, distribution record and signature of transmitter.
- C. Indicate drawing number and specifications section number to which submittal applies.

3.02 ARCHITECTS ACTION ON SUBMITTALS

- A. Architect will respond to submittals from Contractor by completing the "LETTER OF TRANSMITTAL" form.
- B. Architect's Submittal Review: Submittal review does not relieve Contractor(s) of compliance with Contract Documents or local codes. Review is only for conformance with the design intent of the Project and compliance with information given in the Contract Documents. The contractor is responsible to coordinate and to confirm all dimensions for use at the site. The contractor is responsible for coordination of the work of all trades.
- C. Architect's Action: Where action and return is required or requested, Architect will review each submittal and mark per the following, and where possible return within fifteen (15) working days of receipt. When a submittal must be coordinated with submittals of other trades, Contractor is responsible for gathering all information and forwarding to Architect as a single submittal.
- D. Architect's Response:
 - 1. Final Unrestricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with Contract Documents, when submittal is returned with the following: **Marking: "Reviewed"**.
 - 2. Final-But-Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with Contract Documents, when submittal is returned with the following: **Marking: "Reviewed and Noted"**.
 - 3. Returned for Resubmittal: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Do not allow submittals with the following marking (or unmarked submittals where a marking is required) to be used in connection with performance of the Work: **Marking: "Revise and Resubmit"**.
 - 4. Other Action: Where submittal is returned for other reasons, with Architect explanation included, it will not be marked or marked "Revise and Resubmit".

END OF SECTION 01 33 00

WITTENBERG, DELONY & DAVIDSON, INC.

5050 Northshore Ln

North Little Rock, AR 72118

Tel: 501-376-6681 Fax: 501-372-6317

SUBSTITUTION**REQUEST**

**WDD does NOT Pre-Qualify before bidding
To Be Submitted AFTER Award of
Contract**

Project: AGFC - Northeast Regional Field Office Date:

WDD Project No.: 25-065

Contractor:

Contact Person:

Contractor hereby requests consideration of a product substitution as follows:

1. Refer To: Section - _____ and/or Drawing - _____

2. Item Description: _____

3. Proposed Substitution: _____

Manufacturer: _____

Model Number: _____

Description: _____

4. Reason for Substitution: _____

____ Availability _____ Quality Advantage

____ Delivery Schedule _____ Performance Advantage

____ Cost Advantage _____ Other: _____

5. Coordination: _____

Difference in dimensions between the specified and proposed substitute **(WILL)****(WILL NOT)** affect dimensions on drawings and adjacent items.

Describe the effect of the substitution on work of other trades: _____

Describe the effect of the substitution on other required new or existing materials
including electrical wiring, piping, ductwork, finishes, structure, etc.: _____Acceptance of this substitution will cause **(NO CHANGE IN)****(A REDUCTION OF _____ DAYS FROM)** the completion date of this project.Describe any required architectural or engineering design changes required to
accommodate the substitution: _____

6. Differences: _____

The proposed substitution **(MEETS) (DOES NOT MEET)** the reference standards
(ASTM, AWI, UL, etc.) as specified.The proposed substitution **(MEETS) (DOES NOT MEET)** the fire rating classification
(class, type, FM, UL, NFPA) as specified.The proposed substitution is available in the following **(COMPARABLE) (LIMITED)**
(ADDITIONAL) finishes.Note: Any additional cost associated with proposed substitute finishes will be
absorbed by the contractor if this substitution is approved and implemented.

7. Warranty:
Specified Warranty Length and Coverage: _____
Substitute Warranty Length and Coverage (Sample warranty attached): _____
8. This substitution will result in a cost savings and credit of \$ _____.
9. The proposed substitute has been used in the following installations (attached): _____
10. Service and replacement material are available from the following (attached): _____

By submitting this Request for Substitution, the Contractor accepts the following terms and conditions:

1. The proposed substitution, if accepted, will provide performance equivalent to the material or equipment specified. Should a substitution be accepted and should the substitute material or equipment prove defective or otherwise unsatisfactory for the service intended, the Contractor will replace the material or equipment with the material or equipment specified.
2. If the substitution will affect a correlated function, adjacent construction, or work of other trades or contractors, the necessary changes and modifications to affected work are considered to be part of the substitution and will be accomplished without additional cost to the Owner.
3. In the event that the substitution of materials or equipment necessitates the redrawing, redesign, modification or other change to the Contract Documents, the General Contractor will bear all associated costs of these changes.

Contractor warrants that they have verified and believe this substitute is equal or superior to the specified item in all respects. There will be no additional cost associated with coordinating installation of this substitute. Costs and effects of the substitution, as outlined herein, are certified and complete. Claims for additional costs related to acceptance of this substitution, which may become apparent later, are waived.

Manufacturer's product cut sheets, drawings, samples, data sheets, sample warranties, manufacturer's certification, etc. for the substitute are attached.

Contractor: _____

Date: _____

By: _____

Typed Name: _____

Architect's Action:

_____ Substitution is Accepted
_____ Substitution is Rejected for the following reason(s): _____

By: _____

Typed Name: _____

Date: _____

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Testing laboratory services and inspection services.
- B. Contractor to include, in Base Bid, cost of all field and laboratory testing which is required by various sections of Technical Divisions of these specifications. This will include, but is in no way limited to the following tests:
 - 1. Soil Compaction
 - 2. Soil Bearing
 - 3. Parking Lots:
 - a. Subgrade Densities
 - b. Base Course Densities
 - c. Asphalt Densities
 - d. Core Samples to Determine Asphalt Thickness
 - 4. Concrete:
 - a. Making Test Cylinders
 - b. Compression Tests
 - c. Concrete floor moisture vapor emission, in-situ relative humidity and pH (alkalinity) testing at concrete substrates scheduled to receive finish flooring as indicated on Drawings and/or specified in various finish flooring sections. Refer to current version of ASTM F 2170.
 - 1) Testing shall be conducted based on flooring moisture and pH tolerance requirements submitted by finish flooring trades.
 - 2) Areas failed to achieve the required moisture and/or pH levels shall be re-mitigated and re-tested at no additional cost to the Owner.
 - 3) Moisture vapor and pH Test results shall be signed off by respective flooring manufacturers and installers to obtain full warranty on flooring product and installation.
 - 4) The Owner may conduct and pay for his own random moisture and pH tests at his sole discretion to verify and confirm Contractor's test results.
 - 5) Information on grout mixing and placement, and on grout testing is contained in Grouting Concrete Masonry Walls, **TEK 3-2A** and Grout Quality Assurance, **TEK 18-8B** (refs. 1,2), respectively, as published in the National Concrete Masonry Association (NCMA).
 - 5. Topsoil analysis of existing and that brought in off-site
 - 6. Other tests required by Specification Sections

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALIFICATIONS OF LABORATORIES

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as used in Construction".
- C. Authorized to operate in state where project is located.
- D. Testing equipment must be calibrated at reasonable intervals by devices of accuracy, traceable to either National Bureau of Standards or accepted values of national physical constants.

1.05 LABORATORIES DUTIES

- A. Perform specified inspections, sampling and testing of materials and methods of construction. Comply with specified standards. Ascertain compliance of materials with requirements of projects.
- B. Promptly notify Architect and Contractor of observed irregularities or deficiencies of work or products.
- C. Promptly submit written report of each test and inspection; two copies to Architect and one copy to Contractor for record document files. Each report shall include the following:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name, address and telephone number
 - 4. Name and signature of laboratory inspector
 - 5. Date and time of sampling or inspection
 - 6. Record of temperature and weather conditions
 - 7. Date of test
 - 8. Identification of product
 - 9. Location of sample or test in project

10. Type of inspection or test
11. Results of tests and compliance with contract documents
12. Interpretation of test results, when requested by owner or owner's representative.

1.06 LIMITATIONS OF AUTHORITY OF TESTING LABORATORIES

- A. Laboratories shall not be authorized to release, revoke, alter or enlarge on requirements of contract documents; approve or accept any portion of work or perform any duties of Contractor or Architect.

1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to work and operations.
- B. Secure and deliver to laboratory adequate quantities of representational samples of materials proposed to be used which require testing.
- C. Provide laboratory with preliminary design mix proposed to be used for concrete and other materials mixes which require control by testing laboratory.
- D. Furnish copies of manufacturer's test reports of products as required.
- E. Furnish incidental labor and facilities as follows:
 1. To provide access to work to be tested.
 2. To obtain and handle samples at project site or at source of product to be tested.

1.08 SPECIAL INSPECTIONS

- A. Special inspections shall be required in accordance with Chapter 17 of the Building Code. The construction manager (CM) shall be responsible for coordinating all inspections with relevant inspection agency.
 1. Arkansas Special Inspections Guidelines and Special Inspection Forms, revised January 01, 2023, may be downloaded from the Structural Engineers Association of Arkansas website at www.seaoar.org/resources and comply with the 2021 AFPC (2021 IBC in conjunction with the State of Arkansas Amendments), hereafter referred to as the Building Code.
- B. Special Inspector shall keep respective records of inspections. Inspection reports shall be submitted to the Building Official or Authority Having Jurisdiction (AHJ) and to the registered design professional in responsible charge.
- C. Reports shall indicate that inspected work was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official (AHJ) and the registered design professional in responsible charge, prior to the completion of that phase of the work.

- D. A final report of inspections documenting required Special Inspections, and correction of any discrepancies, shall be submitted to the Owner, Building Official (AHJ) and the registered design professional in responsible charge at the completion of respective portion(s) of the work.

1.09 HAZARDOUS MATERIAL ABATEMENT

- A. During the construction of this project, if work involving hazardous material is suspected, or encountered, Contractor shall notify Owner or Owner's representative immediately and Owner, with his own forces or by separate contract is responsible for complete investigation, removal and disposition of hazard material in accordance with applicable laws and regulations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Protect work exposed by or for testing activities and protect repaired work.

END OF SECTION 01 45 23

PART 1 - GENERAL**1.01 GENERAL SITE REQUIREMENTS**

- A. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways.
- B. Ensure safe passage of persons around areas of construction. Conduct operations to prevent injury to adjacent buildings, structures, facilities and persons.
- C. Erect temporary covered passageways as required by authorities having jurisdiction.
- D. Provide dust-proof partitions if required. If not indicated on the drawings, provide dust-proof partitions as directed by the Architect to comply with applicable sections of the Life Safety Code.
- E. Provide temporary enclosures at doors and other openings in walls as necessitated by weather conditions. Construct enclosures with fire retardant treated lumber. Tape joints and caulk to prevent dust and debris from migrating beyond construction areas. Maintain enclosures in good repair and remove when no longer needed.

1.02 PROJECT SIGNS

- A. Subject to prior approval of Owner as to size, design, type, location and to local regulations, Contractor and his subcontractors may erect temporary signs for purposes of identification and controlling traffic.

1.03 JOB OFFICES AND STORAGE

- A. Contractor and his subcontractors shall maintain office and storage facilities on site as may be necessary. Locate so as to cause no interference with work to be performed on the site by Owner or with Owner's operations. Consult with Architect regarding locations. Office shall have as a minimum the following items:
 - 1. Complete set of Construction Documents including all addenda and supplemental information.
 - 2. Data connection: RJ45 throughout unit to support network, voice, and telephone.
 - 3. Layout and meeting space for Architects or Owners representative to use when visiting the site.
 - 4. Complete job file with copies of all correspondence concerning the project.
- B. Upon completion of project, or as directed by Architect, Contractor shall remove temporary structures and facilities from the site, same to become his property. Leave the premises in condition required by Contract.

1.04 SANITARY ARRANGEMENTS

- A. Provide and maintain within the construction area minimum field-type sanitary facilities in accordance with local health and sanitary requirements. Locate the facilities behind the construction fence or out of the public view. Clean units and empty wastes at least once a week or more frequently into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Remove at completion of Work.

1.05 TEMPORARY UTILITIES FOR CONSTRUCTION

- A. Provide all gas and electric service for heating, cooling, lighting and power required for construction purposes.
- B. Provide all water required for construction purposes. Run temporary lines and provide necessary standpipes.
- C. Contractor to pay all utility charges until time of substantial completion.

1.06 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise directed. Allow other entities to use temporary services and facilities without cost, including, but not limited to Construction Coordinator, Design Professional, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water Service from Existing System: Water from Owner's existing water system is available for use with metering and with payment of use charges. Provide meter connections and extensions of services as required for construction operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 50 00

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The contractor is responsible for implementing Erosion Control measures in accordance with State and Federal requirements. The information provided on the Drawings should be considered a minimum for the anticipated construction and conditions. The contractor shall be responsible for adding additional measures as conditions change, at no additional cost to the Owner, as required by the design professional if warranted by site conditions and Contractor's maintenance of site. Additional straw mulch, silt fencing and rip-rap shall be stockpiled on site to quickly maintain or expand erosion control measures as needed due to changing weather and site conditions.
- B. This Section includes the following:
 - 1. Silt fence, diversion ditches and rock ditch checks.
 - 2. Rock protection at ditch and pipe outfalls (Quarry Spalls, i.e., "Rip-Rap")
 - 3. Surface stabilization (seed, sod, poly-ethylene sheeting)
 - 4. Measures to keep streets clean.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 DESIGN REQUIREMENTS

- A. Provide temporary application of mulch cover as a deterrent to soil erosion.
- B. Provide baled straw between project earthwork operations and adjacent areas to prevent scouring, and eroding of soil, and silt runoff.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Mulch Cover: Straw from threshed rice, oats, wheat, barley or rye; of wood excelsior; or from hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue or other legumes or grasses, or a combination thereof. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.
- B. Straw Bales: Straw for barrier bales shall consist of bales of rice, oat, barley, wheat or rye straw or of available grasses free of an excessive amount of noxious weeds. Bales shall weigh approximately 35 pounds. Straw in an advanced state of decomposition will not be acceptable.
- C. Filter Fabric: Typar 3401, Trevira S1115, or approved equal non-woven polypropylene or polyester fabric.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Ensure that earthwork and final grading in area requiring erosion control have been brought to grade as required by Contract Documents.

3.02 INSTALLATION

- A. Straw Bale Filter: Tightly bound straw bales embedded at least 4 inches into soil and each bale held in place by 2 stakes driven at least 18 inches into ground. Bales shall tightly abut adjacent bales. Strings shall not touch the ground.
- B. Silt Fence: Fence post spaced no more than 10 feet apart and driven a minimum of 2 feet into ground. Post shall extend minimum of 2 feet above grade. Fasten metal mesh fence with 6 inch or smaller openings to fence posts to reinforce the silt fence fabric. Mesh fence to extend 2 feet above grade and 4 inches into grade. Mesh may be omitted if reinforced silt fence fabric is used or in areas of low flow.
- C. Non-vegetative Soil Stabilization: Utilize temporary non-vegetative soil stabilization to provide protection against excessive soil erosion over a short period of time. Required in areas that experience high water flows and high runoff velocities and at disturbed slopes steeper than 2:1.
 - 1. Mulch: Apply at 1.5-2.5 tons per acre.
 - 2. Anchor by peg and twine, mulch netting, erosion control, fabric, jute matting or mulch anchoring tool.

END OF SECTION 01 57 13

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED SECTIONS

- A. Section 01 11 00 - Summary of Work (Work by Owner or by separate Contractors).
- B. Section 01 33 00 - Submittal and Substitution Procedures
- C. Section 07 84 00 - Firestopping, if applicable.
- D. 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.

1.03 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

2.01 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 33 00.

PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.03 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.

3.04 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 air tight 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 entire unit.

3.05 SURFACE PREPARATION OF CONCRETE AND MASONRY

- A. The type of surface preparation required for concrete and masonry is dependent upon the type of coating system to be applied and the intended service of the structure. NACE International, the Society for Protective Coatings, the International Concrete Repair Institute, and the American Society for Testing and Materials all reference various methods of surface preparation. Following are surface preparation suggestions of some of the practices recommended by NACE, SSPC, ICRI, and ASTM.
 - 1. SSPC-SP13/NACE 6 Surface Preparation of Concrete: This standard gives requirements for surface preparation of concrete by mechanical, chemical or thermal methods prior to the application of protective coating systems.
 - a. Testing for moisture content (new concrete) ASTM F 1869.
 - b. Repair of surface defects and removal of contaminants.
 - c. Removal of laitance.
 - d. Abrasive blasting. Recommended blasting methods include:
 - 1) dry abrasive with air-blast.
 - 2) hydroblasting with an abrasive.
 - 3) airless centrifugal wheel blast.
 - 4) vacuum blasting.
 - e. Acid etching.
 - f. Reinforcing steel repair.

END OF SECTION 01 73 29

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PART 1 - GENERAL

1.01 CLEANING AND WASTE REMOVAL

A. Progress Cleaning:

1. The premises and the job site shall be maintained in a reasonably neat and orderly condition and kept free from accumulation of waste materials and rubbish during the entire construction period. Remove crates, cartons, and other flammable waste materials or trash from the work areas at the end of each working day. Do not allow debris to blow onto adjoining properties. Respond immediately to requests from adjoining property owners to remove any debris that does manage to show up on adjoining property owners. Collect and remove waste materials, debris, and rubbish from site weekly, daily if necessary and dispose off-site.
2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

B. Final Cleaning:

1. Use cleaning materials and agents recommended by manufacturers or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.
2. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's published instructions.
3. Complete following cleaning operations before requesting inspection for Substantial Completion, where applicable to project scope:
 - a. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains, and other foreign deposits. Rake grounds to a smooth even-textured surface.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project Site.
 - c. Remove snow and ice to provide safe access to buildings.
 - d. Remove debris and surface dust from limited access spaces, including trenches, equipment vaults, manholes, and similar spaces.
 - f. Broom clean concrete floors in unoccupied spaces.
 - g. Leave Project clean and ready for occupancy.
4. Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction.
5. Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from Project Site and dispose of in accordance with requirements of local authorities having jurisdiction.

- a. Extra materials of value that remain after completion of construction and have become the Owner's property are to be stored as directed by Owner.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 74 23

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Upon completion of Work and prior to final payment, a digital electronic copy of the following items must be submitted to Architect, tabbed and with a Table of Contents conforming to the current version of the CSI MasterFormat. Formatted items may be submitted on a thumb drive or via Microsoft OneDrive file hosting service (OneDrive also works as the storage backend of the web version of Microsoft 365 / Office cloud storage):
1. General Contractors letter of warranty
 2. General Contractors letter stating that all deficiency list items are complete
 3. Lien releases
 4. Consent of Surety to pay final retainage
 5. List of all subcontractors and suppliers, including portions of the work performed, address and telephone number of firm, and a contact name familiar with the project. Two (2) copies. One copy in each binder.
 6. Guarantees and Warranties: Refer to specific sections of Project Manual for general requirements on warranties, product/workmanship bonds, and maintenance agreements. Furnish two (2) fully executed copies of each guarantee and warranty specified for review by Architect, one copy in each binder.
 7. Certificates: Fully executed copy of each certificate specified, where applicable:
 - a. Certificate of Occupancy
 - b. Final Termite Inspection
 - c. Final Plumbing Inspection
 - d. Final Electrical Inspection
 - e. Certificate of Air Balance
 8. Miscellaneous other inspection reports, where applicable:
 - a. Boiler and Tank
 - b. Elevators and Hoist Systems
 - c. Backflow Preventers on Potable Water
 - d. Fire Suppression System
 - e. Fire Alarm System
 - f. Security System
 - g. Backup Power Generator
 - h. Cable Test/Certification Reports and Startup Records
 9. Instructions: Operating, service and maintenance manual or instruction sheet for each item as requested by specifications and required for Owner's use.
 10. Building hardware packet as described in Section 08 71 00, if applicable.
 11. Shop Drawings: A complete file of final copies of all shop drawings used in construction of project.
 12. Complete set of all submittals for products used in construction of project.

13. Project Record Drawings: The Contractor shall provide one (1) complete set of project record drawings of scanned images of the drawings.
 - a. Cloud and reference each of the following items on the Record Drawings:
 - 1) written addendum items
 - 2) addendum drawings
 - 3) "X" drawings
 - 4) Supplemental Instructions
 - 5) Change Orders
 - 6) responses to RFI's
 - 7) any other deviations from the original drawings that are made in the field
 - b. Record final locations of underground lines by depth from finished grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, edges, or walks.

B. Owner or user shall bear any printing/shipping costs of as-built project drawings.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.01 EXTENDED WARRANTIES

- A. The entire project is warranted for a period of one (1) year from the date of substantial completion and several materials and systems require extended warranties. It is the responsibility of the General Contractor to review the Project Manual to determine the term of the extended warranties and provide the extended warranties required.

END OF SECTION 01 78 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Site preparation includes, but is not necessarily limited to:
 - 1. Temporary fencing and protective barricades.
 - 2. Protection of trees and shrubs to remain.
 - 3. Felling of trees removed, removal of stumps, roots and debris from Work.
 - 4. Removal of obstructions which interfere with Work.
 - 5. Stripping of topsoil and vegetation from earth areas of site.
 - 6. Removal of concrete and removal of asphaltic concrete pavement.
 - 7. Abandonment and capping wells or cisterns.
 - 8. Demolition and removal of buildings or building elements.
 - 9. Protection of active utilities and removal of utilities abandoned.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Workmen Qualifications: One person present during tree clearing and grubbing operations, thoroughly familiar with types of trees involved. Direct trimming of roots and limbs where required.
- B. Codes and Standards: Comply with pertinent codes and regulations, plus requirements of insurance carriers providing coverage for Work.

1.05 JOB CONDITIONS

- A. Dust Control: Prevent spread of dust during performance of Work. Thoroughly moisten surfaces required to prevent dust nuisance to public, neighbors, and concurrent performance of other work on site.
- B. On-site Burning: Will not be permitted unless approval is given by the local jurisdiction.

- C. Protection: Protect existing objects not to be removed. In event of damage, immediately make repairs and replacements necessary to approval of Architect at Contractor's expense.

1.06 HAZARDOUS MATERIAL ABATEMENT

- A. During the construction of this project, if work involving hazardous material is suspected, or encountered, Contractor shall notify Owner or Owner's representative immediately and Owner, with his own forces or by separate contract is responsible for complete investigation, removal and disposition of hazard material in accordance with applicable laws and regulations.

PART 2 - PRODUCTS

2.01 BARRICADES AND FENCE MATERIALS

- A. Materials required for barricades, tree protection and related fencing furnished by Contractor.

2.02 FILL MATERIAL

- A. Refer to Section 31 00 10, if applicable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Notification: Notify Architect at least two full working days prior to commencing work.
- B. Site Inspection:
 - 1. Prior to work of this Section, carefully inspect entire site and objects designated to be removed or preserved.
 - 2. Locate existing utility lines to be abandoned and determine requirements for disconnecting and capping.
 - 3. Locate existing active utility lines which are to remain and determine requirements for their protection.
- C. Clarification:
 - 1. Drawings do not purport to show all objects existing on site.
 - 2. Before commencing work of this Section, verify with Architect all objects to be removed and all objects to be preserved.
- D. Scheduling:
 - 1. Schedule work in a careful manner with necessary consideration for neighbors and public.
 - 2. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

3.02 DISCONNECTION OF UTILITIES

- A. Before commencing demolition or removal, and if not already accomplished, disconnect or arrange for disconnection of utility service connections, including water, gas, electricity, and telephone, to buildings to be demolished complying with regulations of utility concerned. Plug sanitary sewer lines in accordance with local requirements. Conduct operations at Contractor's expense and in manner to preserve service to areas and structures not demolished. If underground utility services disconnections are required in public thorough-fares, comply with removal and restoration of pavement requirements and other pertinent matters.
- B. Preserve in operating condition active utilities bordering or traversing site designated to remain. Protect property, including, but not limited to, valve boxes, poles, guys and related appurtenances. Repair damage to active utility, due to work under contract, to satisfaction of utility concerned. Remove utility lines that are to be abandoned from building area.

3.03 DEMOLITION OF STRUCTURES

- A. Demolish buildings and/or building elements designated for demolition, pulling out foundations and concrete slabs. Completely remove designated building components and any obstructions above ground level and down to bottom of footings below ground level. Salvageable materials become property of Contractor unless otherwise shown or specified and shall be promptly removed from site.
- B. Fill holes and trenches resulting from demolition and removal, to ground surface. Rock and materials from masonry construction may be used in backfilling up to a depth of 1 foot below ground surface if sufficient fine materials are mixed therewith to fill voids. Use dirt for top 1 foot of fill, free from trash, wood, pipe and debris.
- C. After clearing, perform rough grading necessary to provide complete run-off of surface water.
- D. Barricade open excavations until backfilled. Do not backfill until backfill materials have been inspected and approved by Architect's representative.
- E. Wet down masonry thoroughly during demolition to prevent spread of dust.
- F. Leave parcel site in safe and clean condition, free from rubbish, debris, materials, and equipment.
- G. When Contractor starts building demolition, excluding interior stripping of salvable items including plumbing and electrical fixtures, he is to continue work during normal working days suitable to operations until demolition and site clearance is completed, unless otherwise specifically authorized by Owner.

3.04 PROTECTION AND REPAIR

- A. Erect temporary barricades and fencing required to protect existing and new site construction including but not limited to new and existing walks, drives, roads, curb and gutter, etc. during construction.
- B. Allow no heavy traffic on new or existing paving unless authorized in writing by Owner.
- C. Contractor is responsible for restoring all existing site construction, including softscape (landscape), that is damaged during construction to new condition.
- D. If it is necessary to cut or trench across any existing paving (including walks), Contractor is responsible for restoring damaged areas to new condition.

3.05 PROTECTION OF TREES TO REMAIN

- A. At trees to remain, construct temporary barricade around tree at tree's approximate drip line. Provide barricades at least 3 feet high, consisting of 2 inch by 4 inch or larger posts set at least 18 inches into ground, no more than 6 feet on centers, joined at top by 1 inch by 6 inch or larger boards firmly nailed to posts.
- B. Trimming of Trees: In company with Architect, ascertain limbs and roots which are to be trimmed and clearly mark them to designate approved cutting point. Cut evenly, using proper tools and skilled workmen to achieve neat severance with least possible damage to tree. Promptly coat cut area with approved pruning paint complying with manufacturer's recommendations. In case of root cuts, apply wet burlap or related protection approved by Architect, to prevent drying out.

3.06 REMOVAL OF DEBRIS AND CLEANING

- A. Remove and legally dispose of rubbish and debris found on demolition area at start of the Work that resulting from demolition activities or deposited on site by others during the duration of contract. Keep project area and public right-of-way reasonably clear at all times. Upon completion of work remove temporary construction, equipment, salvaged materials, trash and debris leaving entire project area in neat condition.

END OF SECTION 02 41 13

PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Demolition and removal work required for construction and connecting new Work to existing building and for reconstructing existing building components to remain. Work also includes barricades, temporary protection, dust protection, removal from site trash and debris from demolition work, and repairing existing hardscape/softscape damaged during the course of the work.
- B. Extent of selective demolition work is generally indicated on drawings. Selective demolition not shown on the drawings may be determined by examination of existing facilities and the proposed new and reconstructed work. Existing items not shown on the plans of proposed work and preventing the execution of proposed work are in the scope of the selective demolition work.
- C. Disconnecting, removal and/or relocation and reconnecting of existing mechanical, electrical and fire protection work including equipment, piping and wiring are included in this Contract.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract, Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SCHEDULES

- A. Before commencing any alteration work, submit for review and approval of the Architect, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.
- B. Before starting any work relating to existing utilities that will temporarily discontinue service to the existing building, notify the Owner 5 days in advance and obtain the Owner's approval before proceeding with this phase of work. Do not disconnect or disrupt service without Owner's prior approval.

1.04 HAZARDOUS MATERIAL ABATEMENT

- A. During the construction of this project, if work involving hazardous material is suspected, or encountered, Contractor shall notify Owner or Owner's representative immediately and Owner, with his own forces or by separate contract is responsible for complete investigation, removal and disposition of hazard material in accordance with applicable laws and regulations.

PART 2 - PRODUCTS

2.01 BARRICADE AND SUPPORT MATERIALS

- A. Before starting demolition and removal work, furnish and erect necessary barricades. Barricades shall provide for safe passage at all times.
- B. If approved by Architect, materials from demolition work may be used for construction of temporary protective barricades, temporary partitions, noise barriers and dust barriers and for temporary non-structural supports. Where suitable materials are not available from demolition work, furnish materials of proper type and construction to perform function specified above.

2.02 OTHER MATERIALS

- A. Provide materials, not specifically described but required for proper completion of work of this Section, selected by Contractor subject to Architect's approval.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Make such explorations and probes as are necessary to ascertain required protection measures before proceeding with alteration work. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.
- B. Provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in alteration operations, and adjacent construction.
- C. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster, gypsum board, sprayed fireproofing and similar debris, or by other means. Protect unaltered portions of the existing building affected by the operations under this section by dust-proof partitions and other adequate means.

3.02 REMOVAL OF DEBRIS AND CLEANING

- A. Remove and legally dispose of rubbish and debris found in demolition area at start of the Work that resulted from demolition activities or were deposited on site by others during the duration of contract. Keep project area and public right-of-way reasonably clear at all times. Upon completion of work remove temporary construction, equipment, salvaged materials, trash and debris leaving entire project area in a neat and clean condition.

3.06 PROTECTION AND REPAIR

- A. Erect temporary barricades and fencing required to protect existing and new site construction including but not limited to new and existing walks, drives, roads, curb and gutter, etc. during construction activities.
- B. **Allow no heavy traffic on new or existing paving unless authorized in writing by Owner.**
- C. Contractor is responsible for restoring all existing site construction, including softscape (landscape) and hardscape, that is damaged during construction to new condition.
- D. If it is necessary to cut or trench across any existing paving (including walks), Contractor is responsible for restoring damaged areas to new condition.

END OF SECTION 02 41 19

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Form cast-in-place concrete required and subsequently remove forms except as otherwise specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 318-25: Building Code for Structural Concrete – Code Requirements and Commentary.
 - 2. ACI 347-14(21): Guide to Formwork for Concrete (Re-approved 2021).
 - 3. ACI SP-66(04): ACI Detailing Manual-2004.

1.05 QUALITY ASSURANCE

- A. Qualifications of Workmen: Provide foreman at all times during execution of this portion of the Work, thoroughly familiar with type materials being installed, referenced standards, and requirements of this work, and who shall direct work performed under this Section.
- B. Codes and Standards:
 - 1. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in "Recommended Practice for Concrete Formwork", publication ACI 347 of the American Concrete Institute.
 - 2. Where provisions of pertinent codes and standards conflict with requirements of this Section more stringent provisions govern.

PART 2 - PRODUCTS

2.01 WOOD FORM MATERIALS

- A. Form Lumber: Provide form lumber in contact with exposed concrete using new material except as allowed for re-use of forms. Provide form lumber as follows, a combination thereof, or an equal approved in advance by Architect:
 - 1. "Plyform", class I or II, bearing label of the American Plywood Association.
 - 2. Southern Pine or Douglas Fir, number 2 grade, seasoned, surfaced 4 sides.
- B. Form Sealers: Provide "React S" by Conspec, or approved equal.

2.02 TIES AND SPREADERS

- A. Type: Type which does not leave an open hole through concrete and which permits neat and solid patching at every hole.
- B. Design: Metal not less than one inch from surface at completion of concrete work.

2.03 EXPANSION JOINTS

- A. Non-extruding, pre-moulded filler strips conforming to ASTM D 1751 or D 1752 and compatible with sealant material used to seal joints.

2.04 FORMED JOINTS

- A. Non-staining materials; of wood, plastic, or metals, formed to be removed without spalling concrete.

2.05 KEYED JOINTS

- A. KEY-LOK® by Form-A-Key Products, BoMetals QuicKey by White Cap, Muller Construction Co. or approved equal. Top of stakes set 3/8" below slab surface so when joint form is placed on stakes, painted portion of joint is finished elevation. Finish concrete to top of joint and burn in with hand trowel.

2.06 OTHER MATERIALS

- A. Provide materials, not specifically described but required for completion of concrete formwork as selected by Contractor subject to advance approval of Architect.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF FORMS

- A. General: Construct substantial, sufficiently tight forms to prevent fins and leakage of mortar, and able to withstand deflection when filled with wet concrete.
- B. Layout:
 - 1. Form cast-in-place concrete to shapes, sizes, lines, and dimensions required.
 - 2. Exercise particular care in form layout to avoid necessity for cutting of concrete after placement.
 - 3. Make proper provision for inserts, sleeves, pipes, openings, offsets, recesses, anchorage, blocking, and related features as required.
- C. Forms for footings and related below grade concrete may be omitted when soil and workmanship permit accurate excavation to size and where omission is approved by Architect.
- D. Removal of forms: Time for removing forms is subject to weather conditions after concrete is poured. Remove form work in manner to insure complete safety of structure. Do not place building materials on slabs until they are strong enough to carry the imposed load. Contractor shall decide when to remove forms and accept full responsibility for their removal.

3.02 JOINTS

- A. If proposed layout of joints differs from layout shown on drawings, Contractor shall submit three (3) copies of alternate layout plan to Architect for review. Do not proceed with alternate layout of joints without written approval from Architect.
- B. Provide mechanical "Keyed Kold" joint screed forms used in placing concrete slabs on grade installed to comply with manufacturer's specifications.
- C. Construction Joints: Where joint is made, thoroughly clean concrete surface and remove all latence. In addition, thoroughly wet and slush vertical joints with a coat of neat cement grout immediately before placing new concrete.
- D. Expansion Joints: Do not run reinforcement, corner protection angles, or related fixed metal items, embedded in or bonded into concrete continuous 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 1/2-inch thick and full depth of slab, unless otherwise noted.
- E. Saw-cut Control Joints: In "Green" concrete the following tables will apply.
 - 1. Depth of cut:
 - a. Soff-Cut Saw: 1" minimum
 - b. Wet-Cut Saw: 1/4 slab thickness

2. Joint spacing based upon slab thickness, UNLESS NOTED OTHERWISE:
 - a. 4" slab equals 10'-0" o.c.
 - b. 5" slab equals 13'-0" o.c.
 - c. 6" or thicker slab equals 15'-0" o.c.

3.03 RUBBED SURFACES

- A. Construct forms for exposed cast-in-place concrete with smooth exterior grade plywood or steel with joints butted tight to prevent fins and leaking. As soon as forms are stripped, rub down concrete surface with carborundum grinders using water and Portland cement as rubbing agent. Rub exposed concrete until a uniformly even surface is obtained, with no joint marks or defects showing. Do not apply neat cement or grout to concrete as painted or plastered finish coat.

3.04 JOINT-FREE SURFACES

- A. No joint allowed in formed surfaces where joint-free surfaces are required. In forming for joint-free surfaces, use metal lined forms and cover form joints with form tape.

3.05 CHAMFERED CORNERS

- A. Chamfer corners of rectangular concrete members formed with wood forms except where flush with adjacent concrete or masonry, or where covered with other materials.

END OF SECTION 03 10 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install reinforcement and associated items required for cast-in-place concrete.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
1. Furnish Shop Drawings for review by Architect, on reinforcing steel including special details, bending diagrams, schedules, bar lists, placing diagrams, and accessories. In addition to provisions in General Conditions, submit reinforcing Shop Drawings prepared by or under supervision of registered professional engineer. Reproduction (in any form) of Contract Drawings are not to be used for Shop Drawings. Furnish two prints and one sepia reproducible of Shop Drawings to Architect for review. Submit related shop drawings together. Partial submittals will not be accepted.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Qualifications of Workmen: Provide foreman at all times during execution of this portion of the Work, thoroughly familiar with type materials being installed, referenced standards, and requirements of this work, and who shall direct work performed under this Section.
- B. Codes and Standards:
1. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in "Manual of Standard Practice for Detailing Reinforced Concrete Structures", publication ACI 315 of the American Concrete Institute.
 2. Where provisions of pertinent codes and standards conflict with requirements of this Section more stringent provisions govern.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

- A. Concrete Reinforcement Materials: New, free from rust, and complying with following reference standards:
 - 1. Bars for Reinforcement: "Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A-615, grade 60 unless otherwise shown.
 - 2. Wire Fabric: ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 3. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI CODE-318 except as specified.

2.02 OTHER MATERIALS

- A. Provide metal accessories, including spacers, chairs, ties, and devices necessary for properly assembling, placing, spacing, and supporting reinforcement (including welded wire fabric at 2" from top of slab) in place. Provide materials, not specifically described but required for complete and proper installation of concrete reinforcement, as selected by Contractor subject to approval of Architect.

PART 3 - EXECUTION

3.01 SITE CONDITIONS

- A. Inspection:
 - 1. Carefully inspect installed work of other trades and verify work is complete to point where this installation may properly commence.
 - 2. Verify that concrete reinforcement may be installed to comply with pertinent codes and regulations, reviewed Shop Drawings, and original design.
- B. Discrepancies:
 - 1. In event of discrepancy, immediately notify Architect.
 - 2. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

3.02 BENDING

- A. General: Fabricate reinforcement to comply with reviewed Shop Drawings. Do not use bars with kinks and bends not shown on Drawings or on reviewed Shop Drawings. Do not bend and straighten steel in manner that will injure material.
- B. Assembly: Tack-welding not acceptable for assembly of reinforcement without specific approval of the Structural Engineer. When permitted by Engineer all welding shall conform to reinforcing steel welding code (AWS D.12.1) of the American Welding Society.

3.03 PLACING OF REINFORCEMENT

- A. Placing:
 - 1. Support and wire together reinforcing bars to prevent displacement by construction loads and placing of concrete. On ground and where necessary, supporting Normal Weight concrete blocks may be used. Provide at flat formwork, metal or plastic coated bar chairs and spacers. Provide galvanized, stainless steel or plastic coated accessories where concrete surface will be exposed to weather in finished structure and where rust would impair architectural finishes.
 - 2. Lap welded wire fabric minimum of 12" in structural slabs and minimum of 6" in slabs-on-grade. Support mesh in final position in all slabs. Lifting of mesh into final position is not permitted.
 - 3. Do not bend bars after embedded in concrete.
- B. Cleaning Reinforcement: Remove loose, flaky rust, mill scale, mud, oil, and related coatings that will destroy and reduce bond during concrete placement.
- C. Splices: Splice where shown on Drawings or reviewed Shop Drawings.
- D. Concrete Reinforcement Protection: If not detailed otherwise, where concrete is deposited against ground, reinforcement shall have minimum of 3" concrete between it and the ground. If concrete surfaces after removal of forms are to be in contact with ground or exposed to weather, protect reinforcing with minimum of 2" of concrete for bars larger than No. 5 and 1-1/2" for No. 5 bars and smaller. Provide minimum 3/4" concrete covering for reinforcing in slabs and 1-1/2" minimum cover in beams at surfaces not exposed directly to ground or weather.

END OF SECTION 03 20 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Cast-in-place, reinforced concrete required. Provisions of this Section are applicable to structural concrete at building as well as to site improvement work.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
1. Design Mix: Prior to placement of concrete, submit concrete mix designs proposed by the concrete supplier for class of concrete, including recent test results substantiating the quality of concrete produced by each mix.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Qualifications of Workmen:
1. Provide foreman at all times during execution of this portion of the Work, thoroughly trained and experienced in placing type concrete specified and who shall direct work performed under this Section.
 2. Finishing of Exposed Surfaces of Concrete: Use thoroughly trained and experienced journeyman concrete finishers.
- B. Codes and Standards:
1. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations of "Building Code Requirements for Structural Concrete", publication ACI CODE-318 of latest issue of the American Concrete Institute.
 2. American Concrete Institute, ACI PRC-302.1R-04, or most current revised issue, Guide for Concrete Floor and Slab Construction.
 3. Where provisions of pertinent codes and standards conflict with requirements of this Section more stringent provisions govern.
 4. ACI MNL-66 - ACI Detailing Manual.
 5. ACI SPEC-301-20: Specifications for Concrete Construction.

1.05 LABORATORY TESTING

- A. All required testing will be performed by testing laboratory selected by Owner. Cost for laboratory services for concrete tests and mix designs paid by Contractor. Material for tests furnished by Contractor.
- B. Contractor shall submit three (3) copies of certified laboratory test reports to Architect for review.
- C. Testing Procedures:
 - 1. Material Testing: Laboratory to re-check at plant materials as often as necessary to produce concrete of specified strength and consistency including:
 - (a) Fine aggregate.
 - (b) Coarse aggregate.
 - (c) Cast-in-place concrete.
 - 2. Concrete Slump: 6 inches with allowable variation of plus or minus 1 inch. Selected target slump shall not exceed 9 inches.
 - 3. Quality Control: As work progresses testing laboratory personnel shall conduct tests of concrete in accordance with following procedures:
 - (a) Secure composite samples from the same batch complying with ASTM C 172 for each 150 cubic yards (or fraction thereof) of each concrete mixture each day.
 - (b) Perform one (1) slump test in accordance with ASTM C 143 for each set of compressive test cylinders.
 - (c) Perform (1) air content test in accordance with ASTM C 231 or C 173 for each set of compressive strength test cylinders.
 - (d) Measure concrete temperature in accordance with ASTM C 1064 every hour when ambient temperature is 40 deg F and below, or 80 deg F and above, and one temperature measurement for each composite sample.
 - (e) Measure concrete density in accordance with ASTM C 138 for each set of compressive strength test cylinders.
 - (f) Mold four (4) compressive strength test specimens in accordance with ASTM C31 from each composite sample. Protect and cure under standard moisture and temperature conditions in accordance with ASTM C 31.
 - (g) Test two (2) specimens at seven (7) days complying with ASTM C 39. If specimens for a particular batch test at or above required strength for that batch, it is not necessary to test the remaining specimens. Hold the remaining specimens for an additional ninety (90) days in case future testing is required. If the specimens tested at seven (7) days do not meet or exceed the desired strength requirements, the remaining two (2) specimens will be tested at twenty-eight (28) days. Average strength of two (2) specimens from each group tested is basis for acceptance or rejection of concrete. If tested strength falls below strength specified at twenty-eight (28) days, Architect has the right to order the removal and replacement of defective concrete at Contractor's expense. If Contractor wishes to obtain test cores from in-place concrete, cost of coring, testing and patching will be paid by Contractor.

4. Flatness: Variation in flatness within a 10' area shall not exceed 1/8" +/-.

1.06 REFERENCES

- A. Publications listed below form a part of this specification to extent referenced.
 1. ACI SPEC-117: Standard Specification for Tolerances for Concrete Construction and Materials
 2. ACI PRC-211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 3. ACI PRC-213: Guide for Structural Lightweight-Aggregate.
 4. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
 5. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
 6. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 7. ASTM C260 - Standard Specification For Air-Entraining Admixtures For Concrete.
 8. ASTM C1895-20 Standard Test Method for determination of Mohs Scratch Hardness Tests.
 9. ASTM D5767-18 Standard test Method for Instrumental Measurement of Distinctness of Image (DOI) Gloss of Coated Surfaces.
 10. ASTM E1155-20 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
 11. ASTM C33/C33M-23 - Standard Specification for Concrete Aggregates
 12. PCI - Portland Cement Association - Concrete Slab Surface Defects: Causes, Prevention, Repair, ©2001 or more current publication.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: Conform to ASTM C150 "Standard Specifications for Portland Cement", Type I. Use one brand of cement. Mix shall contain at least 470 lb. of Portland Cement per cubic yard of concrete. Use 520 lb. of cement if freeze thaw deicing chemicals used or required by conditions.
- B. Supplementary Cementitious Materials:
 1. Fly ash will not be allowed.
 2. Slag Cement: ASTM C 989, Grade 100 or 120.
 3. Silica Fume: ASTM C 1240.
 - a. MasterLife SF 100; Master Builders Solutions.
 4. Metakaolin: ASTM C 618, Class N.
 - a. MasterLife MK 828; Master Builders Solutions.

- C. Aggregates: Conform to ASTM C 33 "Standard Specifications for Concrete Aggregates". Provide aggregate of natural sand and gravel or prepared from stone or gravel, free from adherent coatings. Maximum size of pieces 1", except for footings and foundation walls which may be 1-1/2" maximum size.
- D. Water: ASTM C 1602. Clean and free from injurious amounts of oils, acids, alkalis, organic materials, and deleterious substances. **Non-potable water will not be used in concrete mixing.**
- E. Chemical Admixtures
1. Air Entraining Admixture: ASTM C 260. Comply with current building code.
 - a. MasterAir Series; Master Builders Solutions.
 2. Water-Reducing Admixture: ASTM C 494, Type A.
 - a. MasterPozzolith Series or MasterPolyheed Series; Master Builders Solutions.
 3. Retarding Admixture: ASTM C 494, Type B.
 - a. MasterSet R Series or MasterSet DELVO Series; Master Builders Solutions.
 4. Accelerating Admixture: ASTM C 494, Type C.
 - a. MasterSet AC 534 or MasterSet FP 20; Master Builders Solutions.
 5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - a. MasterSet R Series or MasterSet DELVO Series; Master Builders Solutions.
 6. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 - a. MasterSet FP 20; Master Builders Solutions.
 7. High-Range Water-Reducing Admixture: ASTM C 494, Type F.
 - a. MasterRheobuild 1000 or MasterGlenium Series; Master Builders Solutions.
 8. Workability-Retaining Admixture: ASTM C494, Type S. Shall retain concrete workability without affecting time of setting or early-age strength development.
 - a. MasterSure Z 60; Master Builders Solutions.
 9. Viscosity Modifying Admixture: ASTM C 494, Type S.
 - a. MasterMatrix VMA Series; Master Builders Solutions.
 10. Permeability-Reducing Admixture : ASTM C 494, Type S.
 - a. Shall be a Portland cement-based crystalline capillary waterproofing admixture that reacts in concrete to form insoluble crystalline hydration products in the capillary pores of concrete.
 - b. Shall show a reduction in permeability of concrete compared to an identical concrete mixture without the admixture, when tested in accordance with CRD-C 48 at a pressure of 200 psi.
 - c. Shall reduce or have no penetration of water compared to an identical concrete mixture without the admixture, when tested in accordance with DIN 1048 for a duration of 96 hours.
 - d. NSF-61 certified .
 - e. MasterLife 300 Series; Master Builders Solutions.

11. Shrinkage-Reducing Admixture: ASTM C 494, Type S.
 - a. MasterLife SRA Series or MasterLife CRA 007; Master Builders Solutions.
12. Corrosion-Inhibiting Admixture: A nominal 30-percent solution of calcium nitrite or an amine/ester organic corrosion-inhibiting admixture.
 - a. MasterLife CI 30 or MasterLife CI 222; Master Builders Solutions.
13. Alkali-Silica Reaction Inhibiting Admixture: ASTM C 494, Type S.
 - a. MasterLife ASR 30; Master Builders Solutions.

F. Fibers

1. Synthetic Microfibers :
 - a. Shall be manufactured from a proprietary blend of polypropylene resins in compliance with ASTM D 7508 for micro-chopped strands.
 - b. Shall provide a minimum cracking reduction ratio (CRR) of [] percent when tested in accordance with ASTM C 1579.
 - c. Dosage shall be as recommended by the manufacturer.
 - d. MasterFiber M Series or MasterFiber F Series; Master Builders Solutions.
2. Synthetic Macrofibers :
 - a. Shall be manufactured from a proprietary blend of polypropylene resins in compliance with ASTM D 7508 for macro-chopped strands or hybrid chopped strands.
 - b. Shall provide a minimum average residual strength, (or a minimum average equivalent flexural strength, fe,) of [] psi when tested in accordance with ASTM C 1609, using the roller support system in ASTM C 1812.
 - c. Dosage shall be as recommended by the manufacturer. Dosage of fiber for composite steel deck shall not be less than 4 lb/ yd³, as recommended in ANSI/SDI C2017.
 - d. MasterFiber MAC Series; Master Builders Solutions.

2.02 CONCRETE STRENGTHS

- A. Cast-in-place Concrete: Designed to develop 3,500 psi minimum compressive strength at 28 days, unless noted otherwise on Structural Drawings. ***Refer to Division 32, EXTERIOR IMPROVEMENTS for strengths required for various concrete site improvements.***

2.03 GROUT

- A. Non-Shrink, Non-Metallic, Flowable Grout meeting ASTM C1107 (structural steel grouting, base plates, anchor bolts, tuck pointing):
 1. Con-Spec CS-100
 2. W.R. Meadows Sealtight CG-86™
 3. Master® Builders Solutions MasterFlow Series
 4. L&M DURAGROUT™
 5. SikaGrout 212
 6. Kaufman Products SureGrout

7. Euclid N.S. Grout
8. Dayton Superior 1107 Advantage Grout
9. Approved equal.

2.04 CONCRETE FLOOR SEALER

- A. Furnish and apply to concrete surfaces shown on finish schedule as "Sealed Concrete", polyurethane concrete sealer:
 1. Spec Cote Urethane by Dayton Superior. Primer to be Spec Cote WB High Performance Water-Based Epoxy Coating.
 2. Approved equal.
- B. Surface Preparation: Concrete floor should be sound clean and dry and free of oil, dirt, grease, paint, laitance, and the typical membrane forming curing compounds. The concrete should be at least 28 days old. Floors should be mechanically prepared i.e., shot-blast, sandblast, to result in an International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) of between CSP #1-2, or the texture of medium grit sandpaper to ensure proper adhesion. If oils or grease are present chemical degreasers should be used to thoroughly degrease concrete before shot-blasting.
- C. Minimum of two (2) applications are required.
- D. Provide clear color for all applications.

2.04 CONCRETE FLOOR SEALER

- A. Furnish and apply to concrete surfaces shown on finish schedule as "Sealed Concrete", polyurethane concrete sealer:
 1. Spec Cote Urethane by Dayton Superior. Primer to be Spec Cote WB High Performance Water-Based Epoxy Coating.
 2. Approved equal.
- B. Surface Preparation: Concrete floor should be sound clean and dry and free of oil, dirt, grease, paint, laitance, and the typical membrane forming curing compounds. The concrete should be at least 28 days old. Floors should be mechanically prepared i.e., shot-blast, sandblast, to result in an International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) of between CSP #1-2, or the texture of medium grit sandpaper to ensure proper adhesion. If oils or grease are present chemical degreasers should be used to thoroughly degrease concrete before shot-blasting.
- C. Minimum of two (2) applications are required.
- D. Provide clear color for all applications.

2.05 HEAVY DUTY LIQUID FLOORING

- A. Provide Tnemec Series 245 Ultra-Tread S, polyurethane modified concrete, Ultra-Tread S by Tnemec is a low odor, 1/4" slurry applied floor topping designed for abusive service areas. Resists chemicals, organic acids, withstands thermal shock due to hot liquids and aggressive cleaning procedures. Areas may be quickly returned to service within hours of installation.
- B. Ucrete by Master Builders Solutions.

2.06 UNDERSLAB DRAINAGE FILL

- A. Washed crushed stone or washed crushed gravel (AASHTO #57), uniformly graded from 3/4-inch minimum to 1-inch maximum size at depths of 4 to 6 inches. Refer to the drawings.

2.07 UNDERSLAB VAPOR BARRIER

- A. Liner shall have all of the following qualities:
 - 1. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength and Longevity: ASTM E1745.
 - b. Thickness: 15 mils minimum
 - 3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
 - 4. Warranty: (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.
- B. Vapor barrier product:
 - 1. Basis of Design: Stego® Wrap Vapor Barrier (15-mil) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com
- C. Approved Alternate Manufacturers:
 - 1. Griffolyn® Vaporguard® 15-mil manufactured by Reef Industries, 800-231-6074.
 - 2. Moistop Ultra 15 by Fortifiber, (800) 773-4777. <https://www.fortifiber.com/product/moistop-ultra-15/>
 - 3. VaporBlock® by Americover, (800) 747-6095, 2067, Wineridge Place, Ste F, Escondido, CA 92029. Web: www.americover.com
 - 4. Perminator by W.R. Meadows
 - 5. Viper® II by ISI Building Products, (866) 698-6562, 401 Truck Haven Rd, East Peoria, IL 61611. Web: www.isibp.com
 - 6. Vapor Pro™ by Revolution Company, (972) 216-3331, 3328 Executive Blvd., Mesquite, TX 75149. Web: www.revolutioncompany.com

2.08 CONCRETE PATCH AND REPAIR

- A. Provide Adhesives Technology Crackbond® JF Joint & Crack Filler, a two-component polyurea joint filler designed for heavy duty traffic, property repairs and freezer applications. It is solvent free, flexible and with its low viscosity and self-leveling design, allows for 10-15 % movement of installed joint width. It may be used in temperatures between -40 °F to 120 °F (-40 °C to 49 °C). Excellent for the filling of active cracks in concrete in exterior horizontal applications. Polyurea formulation offers long term product adhesion and stability without cracking or deterioration.

2.09 EQUIPMENT PADS

- A. A commercial generator pad is typically a reinforced concrete foundation between 6 and 12 inches thick designed to support the generator's operating weight, fuel load, vibration forces, and anchoring requirements. Most commercial pads use 3,000–4,000 PSI concrete with #4 or #5 rebar reinforcement and must extend 6–12 inches beyond the generator skid on all sides. Key requirements for all equipment pads include:
 - 1. Reinforced concrete construction
 - 2. Proper subgrade compaction
 - 3. Correct conduit stub-up placement
 - 4. Vibration isolation coordination
 - 5. Compliance with NFPA 110, NFPA 37, NEC, and local building codes
 - 6. Drainage and flood-elevation planning
 - 7. For large generators, the concrete foundation is often engineered so the pad weighs at least 125%–200% of the generator's wet operating weight.

2.10 OTHER MATERIALS

- A. Provide materials, not specifically described but required for complete and proper installation of cast-in-place concrete, selected by Contractor subject to approval of Architect.

PART 3 - EXECUTION

3.01 MIXING AND PLACING CONCRETE

- A. Preparation: Clean equipment for transporting concrete. Remove debris, water, and ice from places to be occupied by concrete. Remove laitance and unsound material from hardened concrete before additional concrete is added.
- B. Mixing: Ready-mixed concrete, mixed and delivered in accordance with following requirements only of ASTM C 94.
 - 1. Tolerances in Slump,
 - 2. Measuring Materials,
 - 3. Batching Plant,
 - 4. Mixers and Agitators,

5. Mixing and Delivery,
 6. Use of Non-Agitating Equipment
 7. Inspection.
- C. Conveying: Convey concrete from mixer to place of deposit by methods that prevent separation and loss of materials.
- D. Placing:
1. Deposit as nearly as practicable in final position to avoid segregation due to re-handling and flowing. Place at rate to assure concrete is plastic and flows readily into spaces between bars. Do not use concrete contaminated by foreign material or re-tempered concrete.
 2. When placing is started, carry a continuous operation until placement of panel or section is completed.
- E. Hot Weather Concreting: Place, handle, and cure concrete complying with ACI SPEC-305.1.
- F. Cold Weather Concreting: Provide adequate equipment for handling concrete materials and protecting concrete during freezing and near freezing weather. Concrete materials, reinforcements, forms, and ground in contact with concrete to be free of frost, snow, and ice. Details of approved procedures are available in ACI SPEC-306.1. Contractor to keep accurate thermometer on job where the work is proceeding.
- G. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

3.02 TOPPING SLABS

- A. The existing concrete floor slab shall be sandblasted to a degree that all steel troweled finish is completely removed and results in a pitted surface capable of bonding new concrete topping. Prepare a 2' x 2' sample area for approval prior to proceeding with the work. At locations where topping slab tapers down flush with existing slab, saw cut existing slab 1/2" deep and clip out portion of slab in order to maintain a minimum topping slab thickness of 1/2". Place a bonding agent on roughened slab prior to pouring topping slab. The topping slab shall have control joints spaced 20' maximum in each direction. Joints are to be saw cut 3/4" deep and filled with sealant. Do not leave standing water.

3.03 PROTECTION OF ADJACENT SURFACES

- A. Contractor responsible for any work soiled and stained by dripping cement, water, or concrete. Protect same with tarpaulin or similar devices while pouring concrete.

3.04 CONSOLIDATION

- A. Consolidate concrete by vibration, spading, rodding, or forking. Work around reinforcement, embedded items and into corner of forms. Over-vibrating and use of vibrators to transport concrete within forms not allowed. When consolidating by vibration, keep spare vibrator on job site during concrete placing. Use vibrators of length to extend within 6 inches of bottom of freshly poured concrete, vibrator being raised with each succeeding pour.

3.05 CONCRETE CURING AND FINISHING

- A. **Curing Period:** Cure concrete for minimum period of 7 days at a temperature above 50° F. by one of approved methods listed below. Protect fresh concrete from heavy rain, flowing water, mechanical injury and from injurious action of sun. Comply with ACI SPEC-306.1 for cold-weather protection, and follow recommendations in ACI SPEC-305.1 for hot-weather protection during curing. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- B. **Potable Water Curing:** If cured with water, keep concrete wet by mechanical sprinklers or by any approved method which will keep surface continuously wet.
- C. **Evaporation Retarder:** Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions prevail. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. **Curing Compounds: NO CHEMICAL CURING COMPOUNDS ALLOWED.**
- E. **Waterproofing Paper or Opaque Polyethylene Film:** Conform to ASTM C 171. Cover concrete immediately following final finishing operation. Anchor securely, seal edges or apply in manner to prevent moisture escaping from concrete.
- F. **Curing Blanket:** AASHTO M-182, Class II, ASTM C-171 burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- G. **Concrete Patching:** Immediately after stripping forms, examine surfaces. Patch honeycombing, defective joints, voids, tie holes, and defects before concrete is thoroughly dry. However, make no attempt to correct or fill any honeycomb spots, or any other defects until they have been examined by Architect and approval obtained as to correction to be employed. Finish of patch to match adjoining surface.
- H. **Concrete Finishes (ACI SPEC-301, latest edition):**
 - 1. Interior General: Floor slabs, including topping slabs, to be smooth and steel troweled to hard dense surface (non-burnished), except where required to be depressed. Rough float finish depressed surface. Protect concrete floors during construction period.

2. Exterior: Pads, Steps, Stairs, Slabs and other surfaces to receive light-medium broomed finish for non-slip surface.

3.06 FLOOR SLOPE TO DRAINS

- A. Slope floors to drain outlets. Low spots where pools of water can stand on finished floors are not acceptable. Slope to drains 1/8" per lineal foot unless otherwise marked.
- B. Slope floors uniformly from perimeter walls and partitions to drain outlets (unless otherwise indicated).
 1. At shower pans scheduled to receive Fluid-Applied Flooring (Section 09 67 00), account for slope transitions from both perimeter shower walls and stepless ADA threshold or raised curb.
- C. When multiple drains are shown in a room, space equally. Create dedicated area per drain outlet and slope floor uniformly from area perimeter to drain outlet (unless otherwise indicated).

3.07 BONDING AGENT

- A. Use for patching and resurfacing, spray and fill coats, repairing precast building panels and beams, industrial flooring, and highway and bridge deck repairs. Also for topping, leveling, patching, and dressing of concrete and masonry. Improves the adhesion of concrete or mortars. Mortars modified with bonding agent to provide adhesion to a variety of surfaces, including concrete and masonry. For use as an interface or integral bonding agent in bonding slurries, topping mixtures, finishing, and mortar mixes.
- B. Manufacturers:
 1. Bondall as provided by Lyons Manufacturing, Inc., 214-381-8100.
 2. INTRALOK® by WR Meadows, 800-342-5976.
 3. Siklatex® acrylic-polymer latex by Sika Corporation, 800-933-7452.
 4. Euclid Chemical Co., 800-321-7628.

END OF SECTION 03 30 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Manufacture, deliver, erect, and install precast concrete units specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
1. Product Data: Submit manufacturer's specifications and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.
 2. Shop Drawings: Submit Shop Drawings showing information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section, location, size and type reinforcement, including special reinforcement and lifting devices necessary for handling and erection.
 3. Provide layout, dimensions, and identification of each precast unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.
 4. Provide location and details of anchorage devices that are embedded in related construction. Furnish templates if required for accurate placement.
 5. Include erection procedure for precast units and erection sequence.
 6. Provide manufacturer's complete design calculations prepared and stamped by registered engineer.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Furnish architectural precast concrete products complying with these specifications regarding physical requirements, workmanship, texture, and color.
- B. Manufacturer: Regularly engaged in manufacture of this type product with inspection and quality control system and capability to produce precast units at rate that will not cause delays in Project.

- C. Cast in accurate molds designed to withstand high frequency vibration.
- D. Execute mix design, casting, finishing and curing using manufacturer's standard quality controlled production methods. However, the end product of any method must comply with all the aesthetic and physical characteristics specified.
 - 1. Cast method: Wet cast only; the vibrant dry tamp method is NOT acceptable.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver precast concrete units to Project Site in quantities and at times to assure continuity of installation. Store units at Project Site to ensure against cracking, distortion, staining, and physical damage, and so markings are visible. Lift and support units at designated lift points.
- B. Deliver anchorage items which are embedded in related construction before start of related work. Provide setting diagrams, templates, instructions and directions required for installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Mix Design Type I: Smooth
 - 1. Cement: 4 lb. white
 - 2. Fine Aggregate: 8 lb. Sheridan Masonry Sand
 - 3. Coarse Aggregate: 10.2 lb. 3/8" x #4 Harrison limestone
 - 4. Pigment 1: 17 grams #44 tan oxide pigment
 - 5. Pigment 2: 5.7 grams #638F brown pigment
 - 6. Surface Texture: Acid etch.
- B. Mix Design Type II: Rough
 - 1. Cement: 70% gray, 30% white
 - 2. Fine Aggregate: Crushed reddish brown limestone
 - 3. Coarse Aggregate: 5/8" to 9/32" reddish brown limestone
 - 4. Pigment: Buff
 - 5. Surface Texture: Deep Sandblast.
- C. Reinforcement: Welded wire fabric with the addition of deformed reinforcing bars according to design criteria. Use galvanized deformed bars with one inch and less clearance to an exterior face.
- D. Mechanical, electrical, special equipment and anchors, metal jambs and related items for work of other trades, if required, are supplied to manufacturer for casting into units by appropriate supplier under this Contract.
- E. Anchorage devices, weld plates, inserts, wood nailers and lifting handles as furnished and securely embedded by manufacturer.

- F. Sealant: Refer to Section 07 92 00 for material and installation requirements.

2.02 PHYSICAL QUALITIES

- A. Concrete Mix: Design to have minimum compression strength of 5000 psi at 28 days when tested in 6" x 12" cylinders complying with ASTM C-39 latest revision. ASTM C109 Cube Testing Method is NOT acceptable.
- B. Absorption: Not to exceed 5% maximum when tested complying with ASTM C-97 latest revision.
- C. Water Cement Ratio: Not to exceed 5 gallons per sack of cement.
- D. If mix designs with known test histories are used and semi-automatic batching equipment is employed, only certification of compliance to above is required. If test reports are requested by architect, same paid for by Owner.
- E. Unit Tolerances:
1. Warpage: Not to exceed 1/8" per 6'-0" length of panel.
 2. Squareness: No panel more than 1/8" in 6 feet off square.
 3. Location of Anchors and Inserts: Locate plus or minus 3/8" from center line of location required.
 4. Block-outs and Reinforcing. Locate within plus or minus 1/4" of positions required.
- F. Reinforcing and connections shown on Drawings are adequate for normal temperature and building stresses. Manufacturer is responsible for additional reinforcing and connections necessary for fabrication, transportation, and erection stresses.

2.03 FINISH

- A. Exposed Exterior Panel Faces: Color and texture to be similar to cut limestone. Samples of Northwest Cast Stone "Limestone" (479-200-3367) is on file at the office of the Architect and may be used for comparison. Website: www.nwcstone.com

PART 3 - EXECUTION

3.01 INSTALLATION

- A. If installation is not performed by manufacturer, Contractor assumes full responsibility for the work. Employ skilled supervisors and workmen experienced in this type work.
- B. Handle units in a nearly vertical plane at all times. Stack vertically and lean against proper supports until used, unless otherwise approved by manufacturer.

- C. Center in their allotted space according to approved Shop Drawings and securely bolt or weld as required.
- D. Protect units from staining during installation and after installation.
- E. Rake back and seal joints complying with sealant specifications and details.
- F. After work is completed, repair damaged architectural precast concrete products to satisfaction of Architect, and then wash down and clean entire surface with soap and clear water, preferably from a hose.

END OF SECTION 03 48 43

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Repair and filling of voids, holes and depressions in concrete.
 - 1. On grade, above and below grade, interior and exterior applications.
 - 2. Structural grouting of column base plates, machine base plates, anchor bolts, bearing plates, bridge seats, precast wall panels.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Dayton Superior Corporation, 1125 Byers Road, Miamisburg, OH 45342, Customer Service: 888-977-9600, Technical Services: 877-266-7732 www.daytonsuperior.com

2.02 MATERIALS

- A. Non-Shrink, Non-Metallic Grout: Provide Dayton Superior 1107 Advantage Grout, a non-shrink, non metallic, non-corrosive, cementitious grout designed to provide a controlled, positive expansion to ensure an excellent bearing area.
 - 1. Meet ASTM C1107-20: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink).
 - 2. Approved equal manufacturers:
 - a. MasterFlow® 555
 - b. NS Grout, Euclid Chemical
 - c. Sikagrout® 212
 - 3. Perform grout placement in accordance with the recommendations of ACI and the manufacturer's published specifications for mixing and placing.

- B. Patching Compound: Provide "All-Patch 20".
- C. Feather Patch: Provide Polymer Modified Mortar Conspec "Feather Patch", ChemMasters "FeatherPatch" or approved equal. For exterior (or interior) use and can be applied from feather edge to 1 inch per lift. May be used for horizontal, vertical and overhead surfaces. Install per manufacturer's written recommendations and directions. Must be sealed immediately with water based curing and sealing compound, such as Polyseal™ WB, SafeSeal™ or Safe-Cure & Seal 20.
- C. Two Component Acrylic Polymer Modified Topping and Underlayment: Provide PATCHCRETE® as manufactured by Lyons Manufacturing, Inc., 214-381-8100 or approved equal. Install per manufacturer's written recommendations and directions.
- D. Floor Topping: Provide Level Topping™ Exterior by Dayton Superior, or approved equal. Cement based, nonshrink, self-leveling topping for horizontal concrete designed for exterior use. This is not a gypsum based product.

PART 3 - EXECUTION

3.01 MIXING, PLACING AND FINISHING

- A. Mix in accordance with the manufacturer's directions to consistencies required for application.
- B. Level repaired surfaces flush with adjacent surfaces and trowel to a smooth finish.

END OF SECTION 03 60 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Pre-blended mortar mixes for use in indicated locations and types of masonry construction as specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 REFERENCE STANDARDS

- A. ASTM International:
1. ASTM C91 - Standard Specification for Masonry Cement.
 2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 3. ASTM C150 - Standard Specification for Portland Cement.
 4. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 5. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 6. ASTM C476 - Standard Specification for Grout for Masonry
 7. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 8. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
 9. ASTM C1329 - Standard Specification for Mortar Cement.
 10. ASTM C1384 - Standard Specification for Admixtures for Masonry Mortars.
 11. ASTM E514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
 12. ASTM C 1357 - Standard Test Method for Evaluating Masonry Bond Strength.
 13. ASTM C 1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
 14. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
 15. ASTM C 1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar.
 16. ASTM C 1019-20 - Standard Test Method for Sampling and Testing Grout for Masonry.

- B. International Masonry Industry All-Weather Council (IMIAC):
 - 1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
 - 2. Recommended Practices and Guide Specification for Hot Weather Masonry Construction.
- C. National Concrete Masonry Association (NCMA):
 - 1. NCMA TEK Bulletin #8-2A Removal of Stains from Concrete Masonry.
 - 2. NCMA TEK Bulletin #8-3A Control and Removal of Efflorescence.

1.04 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: Submit selection and verification samples of mortar.

1.05 CLASSIFICATION OF MORTAR

- A. Classification by Volume Measurements: Unless otherwise approved by Architect, conform to ASTM C 270 (or latest version), Table 1, for Cement-lime Mortar.
- B. Classification by Test:
 - 1. Strength test, if required, determined with mortar prepared in laboratory selected by Architect or Owner, using representative materials and in proportions proposed for use. Preparation of and curing of mortar and test cubes shall conform to ASTM Specification C 270 of latest issue. Laboratory tests, if required, paid for by Contractor.
 - 2. Minimum Compressive Strength at End of 28 Days: Not less than that prescribed in ASTM C 270 (or latest version), Table 2, for Cement-lime Mortar.

PART 2 - PRODUCTS

2.01 MORTAR MATERIALS

- A. Mortar Cement & Sand Masonry Mortar: SPEC MIX® Mortar Cement & Sand Masonry Mortar is a dry pre-blended mortar mix containing mortar cement and dried masonry sand formulated for superior bond, workability and board life. Provide standard color palette.
 - 1. Mortar Type: M (2,500 psi).
 - 2. Mortar Type: S (1,800 psi).
 - 3. Applicable Standards: ASTM C 144, ASTM C 270, ASTM C 595, ASTM C 780, ASTM C 1072, ASTM C 1093, ASTM C 1157, ASTM C 1314, ASTM C 1329, ASTM C 1384, ASTM C 1586, ASTM C 1714, ACI 530.1, IMIAC.

- B. Approved Manufacturers:
1. Pro Mix® Masonry Mortar (Type S), as manufactured by Ash Grove Packaging, 315 Phillips Road, North Little Rock, AR 72117, 1-800-548-4219. For colored mortar provide ASH GROVE® Cement Color.
 2. Solomon Colors, Inc. SGS Concentrated Mortar Colors, 800-624-0261. Color to be selected from manufacturer's complete offering.
 3. Glen-Gery (20+ colors). <https://www.glengery.com/mortar>
 4. Amerimix AMX 405 C and 505 C (12 standard colors or custom).
 5. Spectrum Cements (26+ colors). info@spectrumcements.com
- C. Basic Requirements: Conform to ASTM C 270 for materials, aggregate, and water and for storage, measurement, and mixing. Weights per cubic foot of materials in mortar are considered as follows:
- D. Portland Cement: Type I or Type II conforming to ASTM C 150.
- E. Sand: Clean sharp granules, free from loam, acids, alkalies, soluble salts, clay, or organic matter, conforming to ASTM C 144.
- F. Quicklime for Lime Putty: Conform to ASTM C 5 with lime slaked and putty prepared in accordance with ASTM C 270. If hydrated lime is used conform to ASTM C 207, Type S.
- G. Mortar for Laying Exterior Masonry: Waterproofed with Dry Block Mortar Admixture by Grace Construction Products.

2.02 ANTI-FREEZE ADMIXTURE

- A. Mortar admixture for use when temperature drops below 50 deg.F.
- B. Provide Conspec Q-Set, or approved equal.

2.03 GROUT FOR MASONRY SIGNIFICANCE AND USE (ASTM C1019-20)

- A. Grout used in masonry is a fluid mixture of cementitious materials and aggregate with a high water content for ease of placement.
- B. During construction, grout is placed within or between absorptive masonry units. Excess water must be removed from grout specimens in order to provide compressive strength test results more nearly indicative of the grout strength in the wall. In this test method, molds are made from masonry units having the same absorption and moisture content characteristics as those being used in the construction.
- C. This test method is used to either help select grout proportions by comparing test values or as a quality control test for uniformity of grout preparation during construction.

- D. The physical exposure condition and curing of the grout are not exactly reproduced, but this test method does subject the grout specimens to absorption conditions similar to those experienced by grout in the wall.
 - 1. Test results of grout specimens taken from a wall should not be compared to test results obtained with this test method.

PART 3 - EXECUTION

3.01 MORTAR MIXING

- A. Mix complying with manufacturer's instructions. Mix in batches for work immediately on hand. Measure by known capacity volume using barrow, buggy, manufacturer's packages, or related containers or by using approved batching device so specified proportions are consistently maintained. Do not use material that has partially set, been re-tempered, or used, frozen, caked, or become lumpy. Mix mortar with proper water amount for minimum of 3 minutes to desired consistency in batch mixer. Use mortar of as wet a consistency as can conveniently be handled. Do not use mortar which has greatly stiffened and in which cementing material has started to set. Do not re-temper mortar.

3.02 MORTAR USES

- A. **Type N Mortar:** Type N mortar is suitable for general use in exposed masonry above grade. It is recommended for use in parapet walls, chimneys and exterior walls when subject to severe exposure.
- B. **Type S Mortar:** Type S mortar is recommended for use in reinforced and unreinforced masonry where higher flexural strengths than Type N are required.
- C. **Type M Mortar:** Type M mortar is recommended for use in masonry in contact with earth such as foundations, retaining walls, paving, sewers and manholes, and in reinforced masonry.
- D. **Type O Mortar:** Type O mortar is suitable for interior use in non-loadbearing applications.

END OF SECTION 04 05 13

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install specified joint reinforcement, anchors, ties, control joints, and related masonry accessories.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 PRODUCT HANDLING

- A. Protection: Protect masonry accessory materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make replacements necessary to approval of Architect and at Contractor's expense.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers for Masonry Joint Reinforcement, Veneer Anchors, Seismic Anchors and Seismic Joint Reinforcement, Column Weld-on Anchors, Joint Reinforcement, and Brick Veneer Ties:
 - 1. 3GEN Masonry Products, Inc., (800) 556-5785, www.3genmp.com
 - 2. Heckmann Building Products, 800-621-4140.
 - 3. Hohman & Barnard, Inc., (800) 296-0771.
 - 4. Wire-Bond, Memphis, TN, 901-775-9444.

2.02 METAL ACCESSORIES

- A. Brick Ties: Provide No. 103-C Dovetail Triangular Veneer Anchor by Heckmann or approved equal. Anchor securely through sheathing into studs using cadmium plated, hot dipped galvanized, or composite zinc and polymer coated screws. Vertical spacing not to exceed 16" o.c.. Horizontal spacing to match spacing of studs, not to exceed 16".
METAL CORRUGATED SHEET STEEL TIES NOT ALLOWED
- B. Reinforcing Bars: Where shown, Grade 60 conforming to ASTM A 615.
- C. Weep Holes: Provide 3/8" diameter weep hole formed by pulling cord through mortar joint. Install at every third (3rd) head joint horizontally at bottom and three (3) courses down from top of wall, unless otherwise shown on the drawings.
1. Alternate: Hohmann & Barnard QV - Quadro-Vent™ standard cell vent, 3/8" thick x 3-3/8" deep x 2-1/2" high. Color to be Gray
 1. Alternate: Hohmann & Barnard 341W Round Plastic Weep Holes, 3/8" x 4" long and provided with cotton wick. Install per manufacturers written instructions and conform to ASTM D2244, ASTM D638 and ASTM D746.
- D. Cavity Wall Drainage System: Provide 2" thick trapezoidal shaped Mortar Net® with Insect Barrier fabricated in a 90% open mesh. The insect barrier fabric is made of nylon and polyester woven material and is attached to the face of the trapezoidal Mortar Net® material. Mortar Net® Solutions or approved equal; Telephone: 800-664-6638.
1. Verify installation of flashing and completion of first two courses of masonry.
 2. Extend flashing from the bottom of the MortarNet to at least 6 inches above the top of the MortarNet to prevent mortar bridging between the outer wythe and inner wall.
 3. Remove mortar droppings and debris from flashing and weep vents.
 4. Install one continuous row of MortarNet at base of wall in cavity and over all wall openings directly on flashing, with dovetail profile facing upward. For wall cavities that exceed 11 feet in height, place an additional continuous trapezoidal strip on wall reinforcing anchors/ties at every 9 feet to 11 feet of wall height.
 5. Butt ends together. Compress slightly if necessary.
 6. Face Insect Barrier toward the outside of the building.
 7. **Approved Equal Manufacturer:** CavClear® for Masonry Mat or CavClear Insulation System as provided by Archovations, Inc., 715-381-5773.

2.03 FINISHES FOR METAL ACCESSORIES

- A. Finish metal accessories according to the following requirements as set forth in ASCE6/ACI 530.1:
1. Joint Reinforcement, Interior Wall: ASTM A641 Class 1
 2. Joint Reinforcement, wire ties or anchors, in exterior walls or interior walls exposed to moist environment: ASTM A153 Class B2
 3. Sheet metal ties or anchors completely embedded in mortar or grout: ASTM A525 Class G60
 4. Wire ties or anchors in interior walls: ASTM A641 Class 3

5. Sheet metal ties and anchors in exterior walls or interior walls exposed to moist environment: ASTM A153

2.04 CONTROL JOINTS IN CONCRETE MASONRY UNITS

- A. In addition to locations shown on drawings, locate control joints so that spacing does not exceed 1.5 times height of wall or 30'-0" o.c. for reinforced CMU or 25'-0" o.c. for non-reinforced CMU.
- B. Provide preformed gaskets placed in sash grooves of concrete masonry using Dur-O-Wal D/A 2001/2025, or approved equal. Factory extrude from solid section of natural or synthetic rubber conforming to ASTM D-2000 2AA-805, with minimum durometer hardness of not less than 80 when tested in accordance with ASTM D 2240.
- C. At exposed face of CMU, provide backer rod and sealant in addition to extruded sash groove control joint.

2.05 EXPANSION JOINTS IN BRICK VENEER

- A. In addition to locations shown on drawings, locate joints so that spacing does not exceed 1.5 times height of wall or 30'-0" o.c.. Verify with Architect prior to placement. Contractor will bear full responsibility for unauthorized placement of joints.
- B. At Shelf Angles provide 1/4" thick Dur-O-Wal "Soft-Joint" D/A 2010, or approved equal. Closed cell neoprene material shall conform to ASTM D2056 class RE41 or 2A1.
- C. At vertical expansion joints provide 3/8" thick Dur-O-Wal "Expansion-Joint" D/A 2015, or approved equal. Closed cell neoprene material shall conform to ASTM D2056 class RE41 or 2A1.
- D. At exposed face of brick, provide backer rod and sealant in addition to joint.

PART 3 - EXECUTION

3.01 INSTALLATION OF MASONRY ACCESSORIES

- A. Install masonry accessories at proper stages of masonry construction specified in Section 04 20 00 - Unit Masonry, and as required for performance of proper masonry workmanship.
- B. Apply flashing to weather barrier system prior to and/or after installing cladding anchors per weather barrier manufacturer recommendations.

END OF SECTION 04 05 23

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PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Furnish labor, tools, scaffolding, and required equipment, and materials for masonry construction specified and required to provide high quality masonry workmanship.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.
- B. Section 07 65 26 - Self-Adhering Sheet Flashing

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Qualifications of Workmen:
 - 1. For actual cutting and placing of masonry units, use skilled journeyman masons thoroughly experienced with materials and methods specified and thoroughly familiar with design requirements.
 - 2. Have one skilled journeyman mason present at all times during execution of work of this Section who shall personally direct and execute this portion of the Work.

1.05 SAMPLE FIELD PANELS

- A. Erect a sample field panel for each of the following masonry materials required for this project:
 - 1. CMU: include special shapes, sills, single corner units, lintel units, solid cap units, and install a typical Control Joint at the center of the panel.
 - 2. Precast Concrete Trim per Sections 03 48 43.
- B. Each sample panel is to be 6' long by 4' high. Use full size units to show color, color range, texture, bond, profile of joints, and workmanship. After approval, panel will be the standard for minimum workmanship and appearance requirements. Do not remove panel until authorized by Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. **Lightweight Concrete Blocks (C33-1) and/or Normal Weight Concrete Blocks (C33):**
1. Use nominal 8" x 16" face, thickness required. Conform to ASTM C90 (Latest Edition), Type II. For hollow loadbearing concrete masonry units and ASTM C129 (Latest Edition), Type II, for hollow non-loadbearing concrete masonry units. Cut blocks as required to form jambs, sills, and closers. Use normal weight blocks for below grade block work and at exterior block work that is exposed to weather. Lightweight block may be used at all other locations unless otherwise stated on Architectural or Structural Drawings. At Contractors expense, provide certification of ASTM C90 and C129 compliance from certified testing laboratory.
 2. Provide standard "Sash Block" at locations where control and/or expansion joints are called for in CMU construction. Coordinate with control joint material specified in Section 04 05 23.
- B. **Split Face Concrete Block:** Provide Normal Weight Concrete Blocks (C33), full split face unit in "Plain Gray" color. Block must conform to ASTM C90 (Latest Edition), Type II, for hollow loadbearing concrete masonry units and ASTM C129 (Latest Edition), Type II, for hollow non-loadbearing concrete masonry units. Block must be manufactured with 3000 psi (net area)/1300 psi (gross area) concrete. Contractor to verify and submit test report to Architect. Provide "Sash Block" at locations where control and/or expansion joints are called for in CMU construction. Coordinate with control joint material specified in Section 04 05 23.
- C. **Reinforced CMU Construction:** Conform to the provisions of ANSI A41.2 (NBS Handbook 74) and/or ACI/ASCE 530.
- D. **Packaged Materials:** Provide mortar materials specified in Section 04 05 13. Provide masonry accessories specified in Section 04 05 23. Deliver and store packaged materials, including cement, in original packages plainly marked with brand and maker's name. Materials in broken containers and in packages showing water marks and evidence of damage will be wholly rejected. **Mortar color shall be selected by the architect.** MATCH EXISTING COLORED MORTAR.
- E. **Concrete Fill:** Fill voids in concrete block where required with structural masonry grout complying with ASTM C476 and ASTM C404. Refer to NCMA TEK 09-04A and TEK 3-2A. Grout may be Fine or Course depending on use. Do not use mortar for this purpose.

2.02 FLEXIBLE FLASHING

- A. Provide **Rhino-Bond** Aqua Flash 500, #4120 composite sheet type, 40 mil peel and stick no-drool flashing by Wire-Bond® or approved equal. Use termination bar for securing flashing to structure where required at surface-mount substrates incompatible with membrane adhesive.
 - 1. Stainless Steel Drip Edge Flashing - DO NOT USE!

PART 3 - EXECUTION

3.01 LAYING CONCRETE BLOCK

- A. Lay blocks straight, plumb, and in perfect alignment. Protect concrete blocks from weather by covering during storage and after laying. Before using blocks, dry them to moisture content of approximately the average air-dry condition to which finished walls will be exposed. Take care to keep mortar off face surface of exposed blocks. At end of job, clean exposed block walls. Where necessary to fit around wall switches and openings, cut blocks to neat line with power saw. Refer to drawings for spacing and type of reinforcement and anchors required.
- B. Lay block in 1/2 bond [**stack bond**], with mortar finished using a round tool giving concave joints. Nominal thickness of all joints is 3/8" and uniform.

3.02 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances specified.
- B. Maximum variation from plumb:
 - 1. In 10 feet: 1/4 inch
 - 2. In 20 feet: 3/8 inch
 - 3. In 40 feet or more: 1/2 inch
- C. Maximum variation from level:
 - 1. In any bay or up to 20 feet: 1/4 inch
 - 2. In 40 feet or more: 1/2 inch
- D. Maximum variation from linear building lines:
 - 1. In any bay or up to 20 feet: 1/2 inch
 - 2. In 40 feet or more: 3/4 inch
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
 - 1. Minus 1/4 inch
 - 2. Plus 1/2 inch

F. Maximum variation in prepared opening dimensions:

1. Accurate to minus 0 inch
2. Plus 1/4 inch

3.04 PROTECTION OF OPEN CAVITY WALLS DURING CONSTRUCTION

A. Protection:

1. All exposed openings in CMU construction shall be protected during the erection process to prevent water from entering, especially at the tops of walls, and settling within interior cavities causing leaching and other damaging occurrences resulting from capillary action. Secure temporary waterproof membranes at the end of each day's work to prevent rain and snow from entering the cores and cavities. Planks laid on the wall are not considered adequate cover.
2. Refer to the Portland Cement Association publication "Recommended Practices for Laying Concrete Block".

3.05 INSTALLING FLEXIBLE FLASHING

A. Install continuous flexible flashing. Lap material at joints minimum 6" and tightly seal with mastic. Spot bonding of mastic equal to 25% of the flashing area applied at 12 inch intervals is acceptable. Apply mastic by trowel at rate of 50 square feet per gallon unless otherwise shown on the container.

1. Where exposed portions are used as a counter-flashing, lap base flashing at least four inches.
2. Terminate exterior edge beyond face of wall approximately 1/4-inch.
3. Turn back edge up 8 inches unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
4. Terminate interior raised edge in masonry backup unit approximately 2 inches into unit unless shown otherwise.
5. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.
6. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
7. Where ends of flashing terminate turn ends up 2 inch and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
8. Turn flashing up not less than 8 inches between masonry wythes or behind exterior veneer.

3.06 BUILT-IN ITEMS

A. Build in wood blocks, strips, wedges, frames, loose lintels, miscellaneous iron and other items furnished by other subcontractors and which may be required for properly securing their work.

3.07 FREEZING WEATHER

- A. Do not lay masonry when outside air temperature is below 40 degrees F., unless suitable means are provided to heat masonry materials and to protect completed work from freezing for at least 48 hours.

3.08 CLEANING PREMISES

- A. Mason Contractor: Remove rubbish and building materials left over from operations under his charge, whenever directed by General Constructor. Premises must be left clear and clean. When buildings are completed, completely remove mortar droppings.

3.09 BOND BEAMS

- A. Reinforce bond beams as required and fill with 3,000 psi. minimum compressive 28-day strength concrete, unless shown otherwise on structural drawings. **Do not use masonry mortar for this purpose.**

3.10 POINTING AND CLEANING

- A. Cut out defective mortar joints. Refill solidly with mortar and tool to match adjacent work.
- B. On completion clean exposed masonry, removing foreign material, excess mortar and stains. Apply cleaning solution to sample area of approximately 20 square feet at an inconspicuous location approved by Architect. Use cleaning solution specially manufactured for this purpose, applying in accordance with manufacturer's directions. Drench masonry with clean water before applying solution, and after cleaning, rinse with clean water to remove all traces of solution. Protect materials adjacent to masonry from contact with cleaning solution.
- C. High Pressure Water Cleaning: **This method of cleaning will not be allowed on masonry surfaces unless approved by architect and masonry manufacturer.** High pressure water is to be used to saturate the masonry before cleaning takes place and may be used to rinse away cleaning solution and foreign particles after cleaning is complete. Allow mortar to cure for a minimum of seven (7) days before subjecting it to high pressure cleaning. After consulting with Architect and manufacturer for cleaning recommendations, test clean a sample panel of all the materials selected for the work. Apply water at a pressure ranging from 300-500 psi (not to exceed 800 psi). Provide a flow rate of water between 3 and 6 gallons per minute through a "Fan" type, stainless steel tip dispersing a 25° to 50° fan spray. Do not use less than 15° fan spray tip. Application of acidic cleaning compounds through the high pressure system will not be allowed. Do not apply sealer until masonry is completely dry and cleaning has been reviewed by Architect.

END OF SECTION 04 20 00

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PREPARATION OF HOT-DIP GALVANIZED STEEL SURFACES FOR PAINTING

PART 1 - GENERAL**1.01 WORK INCLUDED**

- A. Degreasing surfaces
- B. Surface profiling
- C. Washing and rinsing
- D. Steel, including shop-fabricated bollards, in or near direct contact with grade or not protected by substantial roof or canopy overhang.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. Publications
 - 1. American Galvanizers Association (AGA):
Inspection of Products Hot-Dip Galvanized After Fabrication
Duplex Systems: Painting Over Hot-Dip Galvanized Steel
 - 2. Elsevier, van Eijnsbergen, J.F.H., New York, 1994: *Duplex Systems - Hot-Dip Galvanizing Plus Painting Wet Storage Stain*
- B. Reference Standards
 - 1. American Society for Testing and Materials (ASTM):
A 123/123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A 153/153M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A 780 Repair of Damaged Hot-Dip Galvanized Coatings

D 6386 Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

D 7803 Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating

1.05 QUALITY ASSURANCE

- A. Coating Applicator: Company specializing in painting or Hot-Dip Galvanizing after fabrication.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Load and store galvanized articles in accordance with accepted industry standards.

PART 2 - PRODUCTS

2.01 ACCEPTABLE SURFACE PREPARERS

- A. Members of the American Galvanizers Association or equal, such as painting contractors, approved by the design professional.

2.02 HOT-DIP GALVANIZED MATERIALS

- A. Material for surface preparation suitable for painting is required to be Hot-Dip galvanized as described in ASTM A123/A 123M and A 153/A 153M. Hot-Dip galvanized articles and fabrications may be newly galvanized, partially galvanized or completely weathered.

2.03 HOT-DIP GALVANIZING REQUIREMENTS

- A. Hot-Dip galvanizing practices shall be in accordance with the applicable portions of ASTM A123/A 123M or A 153/A 153M.
- B. Water quenching or chromate quenching conversion coating should be avoided as these processes interfere with paint adhesion and surface preparation.

PART 3 - EXECUTION

3.01 SURFACE SMOOTHING

The following process should only be used if high spots of zinc are visible on the parts to be painted.

- A. Zinc high spots, such as a metal drip line, should be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods.

- B. After cleaning, the surface shall be inspected for conformance to the required zinc thickness in accordance with ASTM A123/A 123M or A 153/A 153M utilizing a magnetic-field-type thickness instrument in accordance with ASTM E 376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with ASTM A 780.

3.02 AQUEOUS ALKALINE CLEANING

This surface cleaning is required for all galvanized steel parts, except for those that have been galvanized less than 24 hours.

- A. An alkaline solution, pH in the range of 11 to 12 but not greater than 13, can be used to remove traces of oil, grease or dirt.
- B. This solution can be applied through immersion in a tank filled with the solution, sprayed on, or brushed on with a soft bristle brush, usually nylon and not steel or copper.
- C. When dipping or spraying, the solution works best in the temperature range from 60 to 85 C (140 to 185F).
- D. After cleaning, rinse thoroughly in hot water under pressure. Allow to dry completely before proceeding.

3.03 SOLVENT CLEANING

This is an alternative to Section 3.02.

- A. Typical cleaning solvents, such as mineral spirits or high-flash naptha, can be used to remove oil and grease. The procedure to be used is as specified in SSPC Surface Preparation Specification 1.
- B. Proper rags or brushes should be used to wipe galvanized parts. Small parts may be dipped or cleaned in ultrasonic baths of solvents.
- C. After cleaning, rinse thoroughly in hot water or water under pressure. Allow to dry completely before proceeding.

3.04 HAND OR POWER-TOOL CLEANING

The following process should be used only if there is visible evidence of wet storage stain on the galvanized surface.

- A. Hand or power-tool cleaning may be used to clean light deposits of zinc reaction by-products, such as wet storage stain, as specified in SSPC Surface Preparation Specification 2 or 3.

3.05 SWEEP BLASTING

This process is required for all galvanized parts, except those that have been exposed to the environment for more than one year.

- A. Abrasive sweep or brush blasting which uses a rapid nozzle movement will roughen the galvanized surface profile. The abrasive material must be chosen with care to provide a stripping action without remove excess zinc layers. Follow the procedures detailed in ASTM D 6386 for abrasive sweep blasting.
- B. Following abrasive blast cleaning, surfaces should be blown down with clean compressed air.

3.06 ZINC PHOSPHATE TREATMENT

This is an alternate process for Section 3.05.

- A. This conversion-coating process consists of treating the newly galvanized zinc surface with an acidic zinc phosphate solution containing oxidizing agents and other salts for accelerating the conversion action. Follow the procedures detailed in ASTM D 6386 for zinc phosphate treatment.
- B. After 3 to 6 minutes, the surface should be washed with clean water and allowed to completely dry before application of the paint system.

3.07 WASH PRIMER TREATMENT

This is an alternate process for Section 3.05.

- A. This process involves the use of metal conditioner to neutralize surface oxides and hydroxides and to etch the surface. Follow the procedures detailed in ASTM D 6386 for wash primer treatment.
- B. For drying time prior to top coating, follow the manufacturer's instructions. This wash-primer treatment may be better suited to certain types of paint systems.

3.08 ACRYLIC PASSIVATION/PRETREATMENT

This is an alternate process for Section 3.05.

- A. The passivation/pretreatment process consists of applying an acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forming a thin film coating. Follow procedures detailed in ASTM D 6386 for acrylic passivation/pretreatment.
- B. Painting is possible any time during a period of four months after application as long as the surface is free of visible zinc oxides or zinc hydroxides.

3.09 REPAIR OF DAMAGED COATING

The following process should be used only if there is visible damage to the zinc coating.

- A. The maximum area to be repaired is defined in accordance with ASTM A 123/A 123 M Section 6.2, current edition.
 - 1. The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.

- B. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A 780 whenever damage exceeds 3/16" in width. Minimum thickness requirements for the repair are those described in ASTM A 123/A 123M Section 6.2 current edition.

END OF SECTION 05 05 16

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install miscellaneous metal items required and specified. Provide miscellaneous bolts, anchors, supports, braces, and connections necessary for completion of Work.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
 - 1. Submit Shop Drawings on miscellaneous metal items for review by Architect, prior to fabrication. Include type, grade, class of metal and sizes, details of fabrication, methods of assembling, connections to supporting construction, reinforcement, and location of hardware.
 - a. **Contract Document electronic files (including all drawings, specifications, addenda and supplemental information) will not be made available to Bidders or Sub-bidders before the award of a Contract nor will they be made available to the Contractor or Sub-contractors after the award of a Contract. Only conventional, paper reproductions of such information will be made available to parties listed above.**
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - 1. Specifications for the Design, Fabrication and Erection of Structural Steel for Building
- B. American National Standards Institute (ANSI):
 - 1. ANSI A14.3, "Ladders, Fixed, Safety Requirements."
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36, "Structural Steel."
 - 2. ASTM A53, "Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe."

3. ASTM A123, "Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."
 4. ASTM A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware."
 5. ASTM A307, "Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength."
 6. ASTM A446, "Specification for Sheet Steel, Zinc-Coated by the Hot-Dip Process."
 7. ASTM A500, "Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes."
 8. ASTM A568, "Specification for General Requirements for Steel, Carbon and High-Strength Low Alloy Hot-Rolled Sheet and Cold Rolled Sheet."
 9. ASTM A627, "Specification for Homogeneous Tool-Resisting Steel Bars for Security Applications."
 10. ASTM A780, "Practice for Repair of Damaged Hot-Dipped Galvanized Coatings."
 11. ASTM B221, "Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube."
- D. American Welding Society (AWS):
1. AWS D1.1 - Structural Welding Code.
- E. Steel Structures Painting Council Specification (SSPC):
1. Steel Structures Painting Manual.

1.05 QUALITY ASSURANCE

- A. Qualifications of Welders: Use certified welders and the shielded arc process for welding performed in connection with work of this Section.
- B. Codes and Standards: In addition to complying with pertinent codes and regulations, comply with:
1. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.
 2. "Code for Welding in Building Construction" of the American Welding Society.
- C. Conflicting Requirements: In event of conflict between pertinent codes and regulations, requirements of the referenced standards, and these specifications, provisions of more stringent govern.
- D. Design, engineer, fabricate and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E 894 and E 935. Conform to the current version of the IBC.
- E. Handrails, guardrails, and their supports to be designed for 50 lbs per linear foot, applied in any direction at the top of the top rail, and a concentrated load of 200 lb applied in any direction at any location along the top of the rail. The uniform load and concentrated loads are not to be applied simultaneously. Other components, including guardrail infill and bottom rails, are to be designed for 100 lbs acting on a projected area of 1 square foot, including the open space between components. The effects of this load are not to be combined with the load on the top rail.

- F. ASTM E 985 - For railing - related definitions and structural performance criteria.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel plates, angles, and other structural shapes shall conform to ASTM A36.
- B. Steel pipe shall conform to ASTM A53, Grade B, Schedule 40.
- C. Galvanized steel pipe and tube shall conform to ASTM A53.
- D. Steel Tubing shall conform to ASTM A500.
- E. Sheet Steel, Galvanized: ASTM A446.
- F. Sheet and Strip Steel, Hot Rolled: ASTM A568.
- G. Extruded Aluminum: ASTM B221.
- H. Anchors and Fasteners for Aluminum: Stainless steel.
- I. Welding Materials: AWS D1.1; type required for materials being welded.
- J. Anchors
 - 1. Threaded Type Concrete Inserts: Galvanized malleable iron or cast steel capable of receiving 3/4 inch diameter machine bolts.
 - 2. Slotted Type Concrete Inserts: Welded box type fabricated with minimum 1/8 inch thick galvanized pressed steel plate with slot to receive 3/4 inch diameter square head bolt and knockout cover.
 - 3. Expansion Shield for Masonry Anchorage: FS FF-2-325.
 - 4. Toggle Bolts: FS FF-B-588.
- K. Fasteners
 - 1. Bolts, Nuts and Washers for Exterior Locations: ASTM A307, galvanized in accordance with ASTM A153.
 - 2. Bolts, Nuts and Washers for Interior Locations: ASTM A307, Grade A, regular hexagon head.
 - 3. Bolts, Round Head: ANSI B-18.5
 - 4. Wood Screws, Flat Head Carbon Steel: ANSI B-18.6.1.
 - 5. Plain Washers, Helical Spring Type Carbon Steel: FS FF-W-84.
- L. Stock Hat Channel for Cladding Support:
 - 1. Galvanized G90 Solid / Vented, 18ga / 16ga for exterior cladding applications.
 - a. Vented hat channels shall be use in horizontal orientation where vertically oriented exterior cladding is detailed to allow for moisture mitigation,

- maintaining a drained and ventilated cavity.
- b. Hat channels can be installed in a number of ways depending on the cladding needs. Where hat channels are used as furring, behind a concealed fastener system, they can be oriented in either direction. In an installation where there are exposed fasteners, they can also be installed either direction, and sometimes in both directions to allow for panels to share hat channels. Channels project out 1".
- c. 16ga hat channels to be used where a heavier duty panel, or more durable support system is required. Use 18ga for lighter weight options.

2.02 FABRICATION

- A. Fabricate steel items according to approved shop drawings and to applicable portions of AISC Specifications. Conceal welds where possible; grind exposed welds smooth and flush with adjacent finished surface. Ease exposed edges to small uniform radius.
- B. Pre-assemble products in shop to greatest extent possible. Disassemble units to extent necessary for shipping and handling. Clearly mark units for re-assemble and installation.
- C. For exposed to view fabrications, use materials which are smooth and free of surface blemishes including pitting, seams marks, roller marks, roller trade names and roughness. Remove blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes including zinc coating.
- D. Fabricate items with joints tightly fitted and secured.
- E. Fit and shop assemble in largest practical sections for delivery to Project site.
- F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
- G. Make exposed joints butt tight, flush and hairline.
- H. Fabricate anchorage and related components of same material and finish as metal fabrication, unless indicated otherwise.

2.03 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.04 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. All steel lintels shall be coated with a zinc rich primer.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inch x 8 inches long.

2.06 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.
- B. Galvanize shelf angles to be installed on exterior concrete framing.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.
- C. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 - 1. ASTM A153 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- D. Preparation for Shop Priming: Prepare un-coated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning":
 2. Apply shop primer to un-coated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 3. Lead Free, Zinc Rich Alkyd Primer - Air Dry: Manufacturer's standard.

2.08 ACCESS DOORS

- A. Manufacturer: Milcor Limited Partnership, 1150 North Cable Road, Lima, OH 45805, 1-800-528-1411, or approved equal.
- B. Standard Flush Door for Drywall Ceilings or Walls - Style DW for Steel Stud or Wood Stud installation: Provide Milcor Style "DW" or approved equal. Provide 22" x 22" door size with screwdriver-operated, flush, cam-type locks. Furnish with factory prime coat and/or **Brilliant White** if located in White hard ceiling application. Verify with architect.

2.09 WALL ACCESS DOORS

- A. Manufacturer: Milcor Limited Partnership, 1150 North Cable Road, Lima, OH 45805, 1-800-528-1411.
- B. Wall Access Doors (all wall types): Provide Milcor style "M", or approved equal. Provide 14" x 14" door size with screwdriver-operated, flush, cam-type locks. Furnish with factory prime coat.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.02 CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION 05 50 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Includes: Provide rough carpentry, and installation of items specified in other Sections, normally installed by carpenters. Section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: Show fabrication and installation details for trusses.
 - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.
 - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 - 6. Show splice details and bearing details.

1.04 QUALITY ASSURANCE

- A. Material Grading: Identify hardboard, particleboard, lumber, and plywood by affixing grademark, stamp, or related identifying marks indicating material grades, rules or standards under which they are produced, and complying with rule or standard under which the material is produced. Use certified inspection agency certified by the Board of Review, American Lumber Standards Committee, to grade lumber species. In lieu of piece grade-marking, a certificate of inspection from an agency certified by the Board of Review, American Lumber Standards Committee may be furnished for precut lumber. Applicable grading rules are as follows:

1. Douglas Fir, White Fir, and Cedar: "Standard Grading and Dressing Rules for West Coast Lumber" as published by the West Coast Lumber Inspection Bureau.
 2. Ponderosa and Western White Pine: "Grading Rules for Western Lumber", published by the Western Wood Products Association.
 3. Southern Yellow Pine: "Standard Grading Rules for Southern Pine Lumber" as published by the Southern Pine Inspection Bureau.
 4. Redwood: "Standard Specifications for Grades of California Redwood Lumber" as published by Redwood Inspection Service.
- B. Plywood: Conform to U. S. Product Standard PS 1 issued by the National Bureau of Standards. Stamp or brand each standard size panel to show type and grade of panel. When used structurally, plywood to meet performance standards for its type as described in Product Standard PS 1 for Douglas Fir plywood. Furnish material identified as to species, grade, and glue type by an approved agency or independent testing laboratory with appropriate affixed grade-marks on each panel. Provide in addition to above requirements, exterior type plywood for permanently exposed plywood in outdoor applications.
- C. Qualifications of Workmen: Provide sufficient skilled workmen and carpenter foreman present at all times during execution of this portion of the Work, thoroughly familiar with type construction involved, materials and techniques specified.

1.05 PRODUCT HANDLING

- A. Protection:
1. Store materials to ensure proper ventilation and drainage. Protect against damage and weather.
 2. Deliver materials to job site and store, in safe area, out of the way of traffic, and shored off ground surface.
 3. Identify framing lumber as to grades and store grades separately.
 4. Protect metal products with adequate weatherproof outer wrappings.
 5. Use extreme care in off-loading lumber to prevent damage, splitting, and breaking materials.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect at Contractor's expense.

PART 2 - PRODUCTS

2.01 LUMBER

- A. Provide lumber for structural carpentry using following species provided grade for each is not lower than minimum shown:
- | | |
|--|--------------|
| 1. Pine, Southern Yellow - SPIB Rules (KD) | No. 2 Common |
| 2. Fir, Douglas - WCLIB Rules | Standard |
| 3. Fir, White - WCLIB Rules | Standard |
| 4. Pine, Western White - WWP A Rules | Standard |

- B. Lumber (except where otherwise noted): Surfaced 4 sides unless, in addition to being dressed, it has been notched, ship-lapped, or patterned.
- C. Lumber Dimensions: Are nominal.
- D. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
 - 1. Design Loads: As indicated.
- E. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- F. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.02 FIRE-RETARDANT AND PRESERVATIVE TREATED LUMBER

- A. Manufacturers: Provide wood treatment by or under license from Chemical Specialties, Inc., One Woodlawn Green, Suite 250, 200 E. Woodlawn Road, Charlotte, NC 28217. ASD. Tel: (800) 421-8661, or approved equal by one of the following companies:
 - 1. Osmose, Inc., 1016 Everee Ln., Griffin, GA 30224
 - 2. Arch Wood Protection, Inc., 1955 Lake Park Dr., Ste. 250, Smyrna, GA 30080
 - 3. Hoover Treated Wood Products, Inc., 154 Wire Rd., Thomson, GA 3082
- B. Fasteners and Connectors: For treated wood and where wood is in ground contact, subject to high relative humidity, or exposed to weather, provide steel fasteners with hot-dip galvanized coating per ASTM A153/A153M; provide steel connectors with hot-dip galvanized coating per ASTM A653, Class G185 sheet with 1.85 ounces of zinc coating per square foot.
- C. Wood Preservative Treatment:
 - 1. ACQ Preserve.
 - a. Use 0.25 lb/cu ft (4.0 kg/cu m) retention.
 - b. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 18 percent for plywood.
 - c. Treat wood in the following locations:
 - 1) In contact with roofing, flashing, or waterproofing.
 - 2) In contact with masonry or concrete.
 - 3) Within 18 inches (450 mm) of grade.
 - 4) Exposed to weather.
 - 5) Other locations indicated.

- D. Fire-Retardant Treatment:
 - 1. Lumber: Comply with AWWPA C20 .
 - 2. Plywood: Comply with AWWPA C2 7, Type A.
 - 3. Surface Burning Characteristics: UL FRS rating; flame spread and smoke developed ratings of 25 or less in a test of 30 minutes' duration.
 - 4. Treatment: D-Blaze®.

2.03 PLYWOOD

- A. Plywood (not otherwise specified or noted on the Drawings): Douglas Fir or Southern Yellow Pine panels, C-D grade for concealed applications and **A-C grade for exposed applications to receive paint or stain**, meeting U.S. Product Standard PS 1. Contractor shall replace any painted exposed-to-view C-D grade plywood at no cost to the owner.
- B. Wall Sheathing (Refer to Section 07 27 23 - Board Product Air barriers):
 - 1. Minimum 11/32 inch thick with supports 16 inches on center and 15/32 inch thick with supports 24 inches on center unless specified otherwise.
 - 2. Minimum 48 inches wide at corners without corner bracing of framing.
- C. Roof Sheathing (Refer to Section 07 27 23 - Board Product Air barriers):
 - 1. Minimum 19/32 inch thick or span rating of 40/20 or 23/32 inch thick or span rating of 48/24 for supports 24 inches on center.
 - 2. Provide continuous slot at ridge where vented, including 2x blocking.

2.04 HARDWARE

- A. Provide rough hardware required for proper installation of carpentry work. Furnish hot-dipped galvanized, nails, spikes, screws, bolts, ply clips and similar items using proper types and ample sizes to fasten and hold the various members securely in place.
- B. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
- C. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

2.05 METAL CONNECTOR PLATES

- A. Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS),

high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.06 MANUFACTURED ENGINEERED WOOD

- A. Provide Glue Laminated construction framing, Microllam or Laminated Veneer Lumber (LVL), Laminated Strand Lumber (LSL), Parallam or Parallel Strand Lumber (PSL), Oriented Strand Lumber (OSL), Rim Boards, Prefabricated Wood I-Joists and related accessories as indicated on the drawings.

2.07 BLOCKING

- A. Provide solid wood blocking system capable of sustaining loads as listed within these documents, including drawings. Do not cut or bend metal studs, or cut wood studs, to achieve flush fit to face of studs. Blocking is to span between vertical studs and be fire resistant where applicable. Verify with architect any condition or loading requirement not listed. 2x solid blocking or two layers of 5/8" or 3/4" plywood, depending on required loads and clearances, may be used at contractor option. Coordinate any electrical and audio visual components, including back-boxes and conduit, with respective contractors.
 1. Attach blocking between studs for support of surface mounted items.
 - a. Plumbing fixtures.
 - b. Toilet partitions.
 - c. Wall cabinets.
 - d. Toilet accessories
 - e. Hardware.
 - f. Architectural woodwork.
 - g. Grab bars.
 - h. Handrails and railings.
 - i. Signage.
 - j. Other items requiring backing for attachment.
 - k. DO NOT IMPEDE ATTIC VENTILATION OVER THE ENTIRE ROOF AREA.**

2.08 OTHER MATERIALS

- A. Provide materials, not specifically described but required for a complete and proper installation using new material, suitable for the intended use, and subject to approval of Architect.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Carpentry: Produce joints true, tight, and well nailed. Lay out, install and fit wood framing, furring, stripping, and blocking as required by conditions encountered.

- B. All Work: Plumb, level, and brace with sufficient nails, spikes, and bolts required to ensure secure attachment and rigidity.
- C. Any piece of work or carpentry material with defects that prevent it from serving its intended purpose satisfactorily, including crooked, warped, bowed, or otherwise defective material, even if within the limits of grade specified, will be rejected. Replace with an acceptable piece.

3.02 TEMPORARY ENCLOSURES AND PROTECTION

- A. Provide temporary enclosures at door, window, and related openings in exterior walls, as necessitated by weather and adverse conditions. Maintain enclosures in good repair and remove when no longer needed. Protect door and window frames.

3.03 STUD WALLS AND PARTITIONS

- A. Sole Plates: Single 2" thick members for walls and partitions.
- B. Studs (unless otherwise called for): 2 x 4's spaced 16" maximum o.c., doubled at sides and heads of openings, tripled at corners and placed to provide end nailing for sheathing. Toenail studs to sole plates with two 8d nails on each face side of each stud. Lay out studs so one occurs at each joint in plywood paneling and gypsum board.
- C. Top Plates: Double 2" thick members for walls and partitions.
- D. Provide plates of same width as studs to form continuous horizontal ties. Provide suitable splice plates at ends of sole plates, securely nailed in place. Nail lower members of top plates to studs and corner posts with two 16d nails at each stud and post. Nail upper and lower members of top plates together with 10d nails spaced 16" o.c.. Use two 10d nails at ends of upper members, and arranged so no joint in an upper member occurs over joint in lower member. Provide trusses and lintels over openings in walls and bearing partitions. Splices in plates not permitted over openings where a plate forms part of lintel.
- E. Provide one row of horizontal blocking between studs, near mid-height of wall. Furnish blocking of same width as studs.
- F. Provide additional blocking for anchorage of wall or ceiling mounted items as follows:
 - 1. Attach blocking between studs for support of surface mounted items.
 - a. Plumbing fixtures.
 - b. Toilet partitions.
 - c. Wall cabinets.
 - d. Toilet accessories
 - e. Hardware.
 - f. Architectural woodwork.
 - g. Grab bars.
 - h. Handrails and railings.
 - i. Signage.

- j. Other items requiring backing for attachment.
 - k. **DO NOT impede attic ventilation over the entire roof area.**
- G. Anchor plates and sills of interior partitions to concrete slab with "Ramset", or approved equal, power-driven drive pins. Use No. 3330 drive pins. Set drive pins not less than 2" from edge of concrete. Spacing of drive pins not to exceed 4 feet on centers with drive pins at ends of all sections of plate.

3.04 ROOF FRAMING

- A. Use roof anchors to anchor roof trusses to top plates. Provide anchors using approved design and made of 18 gauge zinc coated metal. Fasten each anchor in place with nails made especially for that purpose by anchor manufacturer, using one nail at each nail-hold provided. Use one anchor at each end of truss involved.
- B. Roof Trusses:
1. Provide "plate" type trusses constructed with precut and carefully fitted members assembled to ensure uniformity. Construct trusses true to line and dimensions, within 1/4" tolerance for length and 1/8" for height.
 2. Design trusses to meet design requirement set forth on the Roof and Roof Framing Plan requirements. Base computations on net sizes of American Lumber Standards for dressed lumber corresponding to the given nominal sizes which are the minimum permissible. Select each piece for suitability and cut to avoid large and unsound knots at connections.
 3. Provide joint connections and interior bracing for roof trusses as required for approved, engineering designed truss systems by MiTek Industries; Alpine, a Division of ITW Company; Eagle Metal Products or approved equal.
 4. Wood truss fabricator shall submit calculations and shop drawings sealed and signed by a professional engineer registered in the State of Arkansas to the architect for review prior to fabrication.
 5. Erect trusses in position, perpendicular to wall plates. Straighten by nailing temporary spacers to top and bottom chords before application of roof sheathing.
 6. Contractor shall provide bracing for truss chords and web members as required by the truss fabricator. System is not stable until sheathing and permanent bracing are installed.
 7. All lumber used for wood trusses shall be #2 Grade, Kiln Dried Southern Pine; #2 Grade, Kiln Dried Spruce-Pine-Fir; or #2 Grade Hem-Fir or better, UON.
 8. Minimum truss plate size shall be 3" x 5" or 4" x 4" each side of truss at all joints.
 9. Minimum contact areas for truss plates shall be 3.75 square inches on each member at all joints, each side of truss.

3.05 PLYWOOD INSTALLATION

- A. Roof Sheathing: Apply with surface grain at right angles to supports. Support end joints of sheets on bearings and stagger with alternate courses in line. Provide edge blocking or suitable edge support. Fasten plywood in place with 8d nails spaced 6" o.c. at edge and end supports and 12" o.c. at intermediate supports. Provide hold-down clips as required.

1. Attic Ventilation: Hold back or provide continuous slots at roof sheathing or decking per manufacturer's published recommendations at ridges, high eaves, low eave perimeters and hips where indicated on the drawings, to provide complete ventilation over the entire roof area. **DO NOT BLOCK VENTILATION OPENINGS IF SPRAY INSULATION INCORPORATED IN PROJECT.**
- B. Wall Sheathing: Apply with surface grain parallel to supports. Support end joints of sheets on bearings and stagger with alternate courses in line. Provide edge blocking or suitable edge support. Fasten shear panels in place with 10d common nail at 6" o.c. at edge and end supports and 12" o.c. at intermediate supports. Fasten shear panels to cold-formed steel with #8 TEK screws at 6" o.c. at edges and end supports, and at 12" o.c. at intermediate supports.
- C. Sub-flooring: Apply with face grain at right angles to supports with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints, and nail at supported edges 6 inches on center and at intermediate supports 10" o.c.. Provide 1/4" clearance at walls. Install each panel with end joints occurring over supports and end joints staggered.
- D. Underlayment: Apply with edges 1/32" apart at joints, nailed 6" o.c. at edges and 8" o.c. throughout remainder of panel. Nail at edges 3/8" from edges. Provide 1/4" clearance at walls. Do not locate underlayment joints directly over parallel joints of sub-flooring. Plywood combination sub-floor underlayment may be used in lieu of separate layers. If used, install as specified for plywood subfloor, except make all joints occur over supports unless tongued and grooved edges are used. Lightly sand any surface roughness at nail heads or joints to blend with the undisturbed surface.

END OF SECTION 06 10 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install millwork, shelving, ornamental wood items, hardware and accessories specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
1. Shop Drawings: Submit **newly prepared** architectural woodwork Shop Drawings for review by Architect prior to start of fabrication. **Do not duplicate Architect's construction drawings.** Indicate on shop drawings, dimensions, species, matching of panels, profiles of moldings, assembly details, applied finish, surfacing, built-in hardware, and necessary connections to other trades.
 - a. **Contract Document electronic files (including all drawings, specifications, addenda and supplemental information) will not be made available to Bidders or Sub-bidders before the award of a Contract nor will they be made available to the Contractor or Sub-contractors after the award of a Contract. Only conventional, paper reproductions of such information will be made available to parties listed above.**
 2. Brochures: Submit manufacturer's descriptive literature on specialty items not manufactured by the architectural woodworker, as requested by Architect.
 3. Samples: Submit finished samples of each wood species to receive transparent finish.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Standards:
1. "Quality Standards" of the Architectural Woodwork Institute (AWI) are referenced in this specification, however, where more stringent requirements are specified, the more stringent shall govern. Any reference to Premium, Custom or Economy in this specification is as defined in latest edition of the AWI "Quality Standards" and as modified in this specification.

2. Provide Custom grade for any item not given a specific quality grade as defined in latest edition of the AWI "Quality Standards."
- B. Competence: Approved woodwork manufacturer, regularly engaged and well experienced in manufacture of fixtures and wood trim and finish of monumental building type, having reputation for doing satisfactory work on time and successfully completing comparable work. Architect reserves the right to approve woodwork manufacturers selected to furnish woodwork.

1.05 FIELD DIMENSIONS

- A. Woodwork manufacturer is responsible for details and dimensions not controlled by job conditions. Show on Shop Drawings all required field measurements beyond his control. General Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

1.06 PRODUCT HANDLING

- A. Protection: Protect architectural woodwork before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

PART 2 - PRODUCTS

2.01 MILLWORK

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type.
- B. Hardware: Install cabinet hardware furnished under this Section of these Specifications.
- C. Edge Banding: Provide solid wood as shown on drawings. **IRONED ON TAPE EDGE BANDING WILL NOT BE ACCEPTED.**
- D. Drawer Construction: Drawers are to be four-sided, solid wood, drawer box type. **NO PANEL PRODUCTS WILL BE ALLOWED.** Head screw from the inside of the drawer box and install pulls through the drawer box.
 1. Approved Alternate: Blum METABOX steel drawer system, 800-438-6788, as an acceptable product.

2.02 HIGH PRESSURE LAMINATED PLASTIC SURFACES

- A. Provide finish surfaces using products from one of the following High Pressure Laminate (HPL) manufacturers, or an equal approved by Architect, in colors and patterns selected by Architect from manufacturer's standard line, in satin finish General Purpose grade:
 1. Wilsonart LLC, "Wilsonart" designer colors

2. Nevamar Corporation, "Nevamar" designer colors
 3. Formica Corporation, "Formica" designer colors
- B. Fabricate to AWI Quality Standards for "Custom" Grade.
- C. Adhesive: Type I, complying with CS 35.

2.03 STAINLESS STEEL COUNTERTOPS

- A. Stainless steel shall be AISI Type 304, chrome nickel alloy containing 18% chromium and 8% nickel, finished with a #4 satin finish. All exposed welds will utilize a continuous bead type weld and shall be ground and re-grained to match the adjacent #4 satin finish.
- B. Minimum gage for countertop and back splash is 16 gauge.
- C. Fabricate counter tops with formed edges 1-1/4" thick with a marine edge around the perimeter. Counter tops that do not include an integrally constructed sink will not be formed with a marine edge. Reinforce the underside of the counter with steel channels and cover with sound deadening material. Grind all exposed welds smooth and re-grained to match a #4 satin finish.

2.04 HIGH PRESSURE LAMINATED PLASTIC MILLWORK

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for High Pressure Laminate (HPL) and/or Thermally Fused Laminate (TFL) with MDF or particle board (PB) finish on all surfaces.
- B. Provide finish for all surfaces, inside and out, using product from one of the following high pressure plastic laminate manufacturers, or an equal approved by Architect, in colors and patterns selected by Architect from standard range of colors and patterns of approved manufacturer, in satin finish General Purpose grade:
1. Ralph Wilson Plastics, "Wilsonart" designer colors
 2. Formica Corporation, "Formica" designer colors
 3. Nevamar Corporation, "Nevamar" designer colors
- C. Adhesive: Type I, complying with CS 35.
- D. Install thermally fused through-color coordinated PVC edge banding on all drawer and door edges as provided by Charter Industries, 800-538-9088, or approved equal.
- a. 3mm edging at counter tops, drawers, doors, and splashes.
 - b. 1mm edging at cabinet boxes, exposed shelving, and concealed shelving.

2.05 LOW PRESSURE LAMINATED PLASTIC MILLWORK MELAMINE

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for Thermally Fused Melamine (TFM) Laminated finish on interior of doors, drawers, sides, and interior shelves only.

- A. Fabricate according to AWI Quality Standards for "Custom" Grade, Flush Overlay type, for Thermally Fused Melamine (TFM) Laminated finish on cabinet fronts, sides, shelves, interior of doors, drawers and sides and High Pressure Plastic laminated counter tops.
- B. Provide finish for all surfaces, inside and out, using "Melamine" type product, or approved equal in colors and patterns selected by Architect from standard range of colors and patterns of approved manufacturer, in satin finish.
- D. Install PVC edge banding on all drawer and door edges as provided by Charter Industries, 800-538-9088, or approved equal.
 - a. 3mm edging at counter tops, drawers, doors, and splashes.
 - b. 1mm edging at cabinet boxes, exposed shelving, and concealed shelving.

2.06 HARDWARE

- A. Cabinet Doors: **(All pulls shall be ADA compliant)**
 - 1. 1 Pair Hinges: Bright Nickel Plated Steel, Medium-Duty, concealed style with a minimum 110 degree opening capability with three-dimensional adjustment and automatic closing as manufactured by SALICE or approved equal. Provide Clip Mounting Plate where required.
 - 2. 1 Pull: Amerock 3-3/4 Inch (96mm) CTC Bar Pull #19011SS Stainless Steel
 - 3. 1 Cam Lock, where required, masterkeyed and keyed alike in groups as directed by Architect. Provide Cam Locks for 20% of cabinet doors equal to Medeco Cabinet Locks or as indicated on the drawings.
 - 4. Provide self-adhesive rubber silencers at each corner of the leading edge of cabinet doors.
- B. Cabinet Drawers:
 - 1. 1 Pair Drawer Slides: KV® Tru-Trac TT100 ball-bearing type (Length as required) at face-frame or frame-less construction. Provide heavy duty, full extension drawer slides at file drawers and all drawers over 7" deep.
 - 2. 1 Pull: Amerock 3" CTC Bar Pull #19010SS Stainless Steel
 - 3. 1 Cam Lock, where required, masterkeyed and keyed alike in groups as directed by Architect. Provide Cam Locks for 20% of cabinet drawers UON.
- C. Adjustable Cabinet Shelf Supports: Millwork subcontractor to install in-line 5mm bore holes with Knappe & Vogt 332 ANO Shelf Support clips where indicated or required.
 - 1. Approved equal: Handy Button Shelf Spoon for 5mm holes, 5/16" Pin Length, Nickel finish, Item Number: THB6144.
- D. Grommets: Provide grommets where shown on millwork drawings by Doug Mockett & Co., P.O. Box 3333, Manhattan Beach, California 90266, 213-318-2491, or approved equal. Color to be selected by Architect from manufacturers standard line. Exact locations to be verified with Architect before installation.
 - 1. Provide MFG1/A-Metal Flex Grommets: 2-11/16 inch overall, 3-3/8 inch cutout in solid surface or quartz surface countertops.

- F. **Waste | Recycle Space Organizers:** Provide Salice America 19-1/2" High components for bottom mount with adjustable door mount bracket for direct pull-out:
1. 15" Wide x 19-5/8" Deep, Part No. QPAM15228CR for 18" Wide millwork Module for two-32 quart container (double) capacity each.

2.07 COUNTER SUPPORT BRACKETS

- A. **EH-Inside Wall Mount Counter Support Bracket:** Provide Model No. EH-1818FM flush-mounted ADA-compliant Counter Support Bracket as manufactured by Rakks, 800-826-6006, where indicated on drawings. Install according to manufacturer's published recommendations. Flush mounts should be screwed into wood studs with #14 screws in 3 places. Verify that required wood stud blocking is installed correctly.
- B. 2.0" Concealed Brackets: Provide 9" to 30" Support Arm, 2" tall, as manufactured by A & M Hardware, Inc., 888-647-0200 or approved equal.

2.08 INSTITUTIONAL GRADE CABINET LOCKS

- A. All cabinet door, drawer, and sliding door locks shall be easily rekeyable such as manufactured by **Olympus Lock, Inc.** All locks will provide a set screw cylinder release system (US Patent 4,899,563) or speed-release cylinder removal system (US Patent 5,121,619) so easy access to the cylinder and cylinder housing can be gained by facility or locksmith personnel for servicing and re-keying. Only a similar patented system that provides working top slides for easy access to top springs and pins is acceptable. No crimping on top slides will be considered. Cylinder spacers will be provided to allow flush fit of lock cylinders on outside of cabinet material. All cam lock cylinders to include a working top slide mechanism and retainer staple to permit easy re-keying and maintenance of lock. All cam locks will have a 1 inch face diameter and include an anti-rotation plate to trap the hex nut and prevent the lock from twisting in the hole. All cam locks to be field reversible such that one straight and one offset cam will provide all locking positions. All locks will provide functionality such that the Keyway will remain in the vertical position regardless of installation as a door or drawer. Finishes will be similar to BHMA standards for US3, US4, US26D and US10B. No painted finishes will be acceptable.
- B. MANUFACTURER: Olympus Lock, Inc., Lynnwood, WA, www.olympuslock.com
Contact: Tel.: (206) 362-3290, Email: info@olympuslock.com.

2.09 OTHER MATERIALS

- A. Provide materials, not specifically described but required for complete and proper installation of architectural woodwork, selected by Contractor subject to approval by Architect.

PART 3 - EXECUTION

3.01 FABRICATION

- A. Fabricate millwork, ornamental wood, and countertops to comply with reviewed Shop Drawings and referenced standards.

3.02 UNDER-COUNTER AND BUILT-IN ITEMS COORDINATION

- A. Prior to fabrication, verify exact location of specified and Owner Furnished under-counter and built-in items. Verify dimensions of appliances and equipment to be installed within the millwork. Notify Architect immediately of any dimensional discrepancies that would interfere with installation of under-counter or built-in items.

3.03 INSTALLATION

- A. Install architectural woodwork true, square, plumb, level, and firmly anchored for long life under heavy use.
- B. Install standing and running trim with minimum number of joints. Use full-length pieces, from maximum length of lumber available, to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with Quality Standards for joinery. Butt joints, except as detailed, are not acceptable.
- C. Paneling: Anchor paneling to supporting substrate with concealed panel hanger clips and by blind nailing on backup strips, splined connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
- D. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

3.04 FINAL INSPECTION

- A. General: Prior to final inspection and acceptance by Architect, completely check each installed item and adjust for proper operation.
- B. Compliance:
 - 1. Owner reserves right to request and pay for inspection by representative of the Architectural Woodwork Institute to determine that work of this Section has been performed to comply with referenced standards.
 - 2. In event above inspection determines architectural woodwork, or any part of it does not comply with referenced standards, contractor pays all costs for initial inspection and all subsequently required re-inspections. Immediately remove non-complying items, and immediately replace them with items complying to referenced standards of these specifications, at Contractor's expense.

END OF SECTION 06 40 00

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent and location of polymer fabrications is indicated on the drawings.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Product Data:
1. Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
 2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.
- D. Shop Drawings:
1. Submit fully dimensioned shop drawings showing countertop and window sill layouts, joinery, terminating conditions, substrate construction, cutouts and holes. Show plumbing installation provisions. Include elevations, section details, and large scale details.
- E. Samples:
1. Submit selection and verification samples for each color, pattern, and finish required.
- F. Quality Assurance Submittals:
1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
 2. Warranty: Specimen copy of specified warranty.
- G. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.04 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.
- B. Adhesives, Sealants, and Sealant Primers:
 - 1. SCAQMD (South Coast Air Quality Management District) Rule 1168.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator Qualifications: Documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.
 - 2. Installer Qualifications: Documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.
- B. Allowable tolerances:
 - 1. Variation in component size: 1/8".
 - 2. Location of openings: 1/8" from indicated location.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect units during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

1.07 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 - PRODUCTS

2.01 MANUFACTURER

?

- A. Provide products of one of the following manufacturers:
 - 1. Corian® surfaces from the DuPont company
 - 2. Wilsonart® Solid Surface (basis-of-design)
 - 3. LG Hausys HI-MACS® America, Inc.
 - 4. LOTTE Staron®
 - 5. Avonite Surfaces®
 - 6. Approved equal.

2.02 SOLID POLYMER FABRICATIONS

- A. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
- B. Reception Areas: Horizontal surfaces of 1/2" thick solid polymer material adhesively joined with inconspicuous seams; edge details as indicated on Drawings. Vertical surfaces of 1/2" material; eased edge detail to be 1-1/2" profile with 1/8" Round Over unless otherwise indicated on Drawings.
- C. Table tops: 1/2" thick solid polymer material, adhesively joined with inconspicuous seams; edge details as indicated on Drawings.
- D. Countertops with sinks: 1/2" thick countertop of solid polymer material; edge details as indicated on Drawings, complete with **Drop-In Double Bowl Sink**. Provide counter complete with backsplash of size shown. Refer to plumbing drawings for sink model selection; eased edge detail to be 1-1/2" profile with 1/8" Round Over unless otherwise indicated on Drawings.
- E. Window sills (verify): 1/2" thick solid polymer material, adhesively joined with inconspicuous seams; edge details as indicated on Drawings.
- F. Color(s) to be selected by Architect from manufacturer's standard line.
- G. References:
 - 1. DuPont™ Corian® Solid Surface Product Fabrication - Directional Aesthetics (K-26833).
 - 2. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Edge Details and Build-ups (K-25293).
 - 3. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Backsplashes (K-25294).
 - 4. DuPont™ Corian® Solid Surface Fabrication/Installation Fundamentals - Thermoforming (K-25297).

2.03 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.
- B. Sealant: Manufacturer's standard mildew-resistant, FDA recognized silicone sealant in color to be selected by Architect from manufacturer's standard line.
- C. Bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount bowls.

2.04 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" wide reinforcing strip of solid polymer material under each joint.
- D. Provide holes and cutouts for plumbing and accessories as indicated on the drawings.
- E. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Finish: All surfaces shall have uniform finish.
 - 1. Matte, with a gloss rating of 5 - 20.
- G. Provide permanently attached thermo-formed 1/2" radius coved back splashes specified and install per industry standards. End splashes shall be provided loose for installation at the job site after horizontal surfaces, to which they are to be attached, have been installed. Comply with forming data from manufacturer.
 - 1. Construct matching molds of plywood to form component shape.
 - 2. Form pieces to shape prior to seaming and joining.
 - 3. Cut pieces larger than finished dimensions. Sand edges. Remove all nicks and scratches.
 - 4. Heat entire component uniformly prior to forming.
 - 5. Prevent blistering, whitening and cracking of solid polymer material during forming.
- H. Thermoforming: Comply with forming data from manufacturer.
 - 1. Construct matching molds of plywood to form component shape.
 - 2. Form pieces to shape prior to seaming and joining.
 - 3. Cut pieces larger than finished dimensions. Sand edges. Remove all nicks and scratches.
 - 4. Heat entire component uniformly prior to forming.
 - 5. Prevent blistering, whitening and cracking of solid polymer material during forming.
 - 6. Provide permanently attached thermo-formed coved back splashes specified and install per industry standards. End splashes shall be provided loose for installation at the job site after horizontal surfaces, to which they are to be attached, have been installed.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer must examine the substrates and conditions under which polymer fabrications are to be installed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 JOB MOCK-UP

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for architect review.
- B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- C. Approved mock-ups shall remain as part of finished work.

3.03 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Adhere bowls to countertops using manufacturer recommended adhesives and color-matched silicone sealant.
- D. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- E. Make plumbing connections to sinks in accordance with Division 15, Mechanical.
- F. Protect surfaces from damage until Date of Substantial Completion. Replace damaged work that cannot be repaired to architect's satisfaction.
- G. Fabricator/Installer is to provide a commercial care and maintenance video, review maintenance procedures and warranty details with the Owner upon completion of project.

END OF SECTION 06 61 16

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PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Fiberglass reinforced plastic (FRP) wall panels.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCE STANDARDS

- A. ASTM International (ASTM) (www.astm.org):
 - 1. ASTM D 2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 2. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 3. ASTM D 5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 - 4. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials..

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors at temperature and humidity conditions in accordance with manufacturer's instructions.

4. Store materials on flat, level surface, raised above floor, with adequate support to prevent sagging.
5. Store materials out of direct sunlight.
6. Protect materials and finish during storage, handling, and installation to prevent damage.

1.06 WARRANTY

- A. Warranty Period: 1 year from date of purchase.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: VALTO, Inc. (formerly Crane) 23525 West Eames Street, Channahon, Illinois 60410, 815-467-8600. Web: www.VALTOfrp.com
Approved equal manufacturers:
1. Marlite®, (800) 377-1221, info@marlite.com
 2. Interstate Plastics, 300 Commerce Circle, Sacramento, CA 95815, (916) 679-5146, www.interstateplastics.com
 3. Panolam® Surface Systems, (877) 726-6526, www.panolam.com
 4. FiberLite® FRP, Nudo Products, Inc., (800) 826-4132, Springfield, IL, www.nudo.com
- B. Single Source: Provide FRP panels and accessories from single manufacturer.

2.02 MATERIAL

- A. Self-Adhered FRP Panels and Trims: GLASBOND with SURFASEAL.
1. Panel Composition: GLASBORD PWIP Skin with Pressure Sensitive Foam Backing.
 2. Color: White (85).
 3. Finish: Smooth.
 4. Thickness: 0.14" (overall thickness) | 0.075" (smooth).
 5. Available Sizes: 4' x 8' | 4' x 10'.
 6. Fire Rating: Class C per ASTM E-84.
 7. Panels shall be installed in accordance with manufacturer's guidelines as set forth in the Crane Composites Installation Guide (Form #6876).
- B. Panel Compliance: ASTM D 5319.
- C. Panel Surface Protection: "Surfaseal" molecularly-bonded surface protection film for impact, abrasion, and scratch resistance.
- D. Panel Color: 85 White.

- M. Panel Dimensions:
 - 1. Nominal Thickness: 0.075 inch (smooth).
 - 2. Wall Panel Size: 4 feet by 8 feet and as indicated on the Drawings.

2.03 ACCESSORIES

- A. Moldings, Trim, and Caps: 1-piece extruded polypropylene or PVC, configured to cover panel edges and corners.
 - 1. Color: 85 White (Match FRP panels).
- B. Panel Adhesive: As recommended by FRP panel manufacturer for required substrates.
 - 1. VOC Content: Maximum 50 g/L.
- C. Panel Seam Sealant: Bright white, 2-part urethane sealant, as recommended by FRP panel manufacturer.
 - 1. VOC Content: 0.0 g/L.
- D. Rivets:
 - 1. Color: Match FRP panels.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive FRP panels.
- B. Examine Substrate Surfaces to Determine:
 - 1. Corners: Plumb and straight.
 - 2. Surfaces: Smooth, sound, and uniform.
 - 3. Nails or Screw Fasteners: Countersunk.
 - 4. Joints and Cracks: Filled flush and smooth with adjoining surfaces.
- C. Notify Architect of conditions that would adversely affect installation or subsequent use.
- D. Do not begin preparation or installation until unacceptable conditions are corrected.

3.02 PREPARATION

- A. Clean substrates to remove substances that could impair bond of adhesive, including oil, grease, dirt, dust, or other contaminants.
- B. Acclimate FRP panels by unpacking and placing in installation space a minimum of 24 hours before installation.
- C. Lay out FRP panels before beginning installation.
 - 1. Locate panel joints to provide equal panel widths at ends of walls.

2. Locate panel joints to provide trimmed panels at corners a minimum of 12 inches wide.

3.03 INSTALLATION

- A. Install FRP panels in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install FRP panels plumb, level, square, flat, and in proper alignment.
- C. Install FRP panels to be water resistant and washable.
- D. Install FRP panels with manufacturer's recommended gap for panel field and corner joints.
- E. Fasteners:
 1. Use fasteners in accordance with manufacturer's instructions to install FRP panels securely to supports.
 2. Pre-drill fastener holes in FRP panels, 1/8 inch greater in diameter than fasteners.
- F. Adhesive:
 1. Install FRP panels in full spread of adhesive.
 2. Follow adhesive manufacturer's instructions for application of adhesive.
- G. Install trim accessories with adhesive and nails or staples.
 1. Do not fasten through FRP panels.
- H. Sealant:
 1. Fill grooves in trim accessories with sealant before installing FRP panels.
 2. Bed inside corner trim in bead of sealant.
 3. Remove excess sealant and smears as FRP panels are installed.
 4. Clean in accordance with sealant manufacturer's instructions.
- I. Tolerances: Install FRP panels within manufacturer's installation tolerances.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: If requested by Owner, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.05 ADJUSTING

- A. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

- B. Remove and replace with new material, damaged components that cannot be successfully repaired, as determined by Architect.

3.06 CLEANING

- A. Clean FRP panels promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.07 PROTECTION

- A. Protect installed FRP panels and finish surfaces from damage during construction.

END OF SECTION 06 83 16

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish labor, materials, tools, and equipment required and perform waterproofing work specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Qualifications of Installers: Perform work under this Section by specialty subcontractor regularly engaged in performance of type work required. Use workmen experienced in installation of specified products. Applicator to provide qualified, competent foreman present and in charge at all times work under this Section is performed.
- B. Installer Guarantee: Furnish written guarantee for waterproofed under this Section against leakage for period of 2 years after acceptance, making good at his own expense leakage which may develop within guarantee period.

1.05 PRODUCT HANDLING

- A. Protection: Protect waterproofing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to Architect approval and at Contractor's expense.

1.06 WATER AND VAPOR TRANSMISSION PREVENTION

- A. Refer to Section 07 26 16 - Under Slab Vapor Barrier.

PART 2 - PRODUCTS

2.01 COLD-APPLIED MEMBRANE WATERPROOFING

- A. **MANUFACTURERS:** Provide Polyguard 650 Sheet Membrane Waterproofing System as manufactured by Polyguard Products, Inc., Ennis, Texas 75120-0755, phone: 800-541-4994 or approved equal.
- B. **PRODUCTS:** Self-adhesive Membrane Waterproofing: Polyguard 650 Membrane, a 60 mil rubberized asphalt membrane consisting of a high density polyethylene film bonded to a layer of rubberized asphalt meeting or exceeding the following requirements:
- C. **Accessory Products**
 - 1. Substrate Conditioner: Polyguard 650 LT Liquid Adhesive or Polyguard ShurTac Water Based Liquid Adhesive, or approved equal.
 - 2. Mastic: Polyguard 650 Mastic, or approved equal.
 - 3. Liquid Membrane: Polyguard LM-95, or approved equal.
 - 4. Termination Bar: Polyguard Termination Bar, or approved equal.
- D. **Protection Course:**
 - 1. For horizontal applications: Polyguard Asphaltic Protection Board, or approved equal.
 - 2. For vertical applications: Polyguard Asphaltic Protection Board or polystyrene protection board (by others).
- E. **Prefabricated Drainage Composite:** Polyguard Drainage Composites Flow 15-P for vertical applications or Flow 18-H for horizontal applications. Polyguard Drainage Composites shall be designed to promote positive drainage while serving as a protection course.
- F. **Prefabricated Perimeter Drainage Composite:** Polyguard Total Flow System including Universal "T" Connectors and/or Outlet Connectors as needed for facilitate perimeter drainage, or approved equal.

2.02 LIQUID COLD-APPLIED WATERPROOFING

- A. Sikalastic® HLM 5000 one-component, moisture-curing, bitumen-modified polyurethane elastomeric waterproofing membrane for exterior below-grade or between slab applications. Provide 60 mil minimum thickness.
- B. W.R. Meadows, Inc. HYDRALASTIC™ 836 Cold-Applied, Single Component Waterproofing for use on interior or exterior concrete surfaces, vertical or horizontal, above-grade and below-grade. Use for positive-side waterproofing for foundations and in between-slab applications.
- C. TREMproof 250GC single component, Rapid Curing, Fluid-Applied Elastomeric Waterproofing membrane as manufactured by TREMCO, (800) 321-7906.

2.03 MASONRY CAVITY WALL DAMPPROOFING

- A. At exterior above-grade masonry cavity walls, provide material applied to the outer face of the inner masonry wythe.
 - 1. W.R. Meadows SealTight Sealmastic™ Emulsion. TYPE I (spray-grade), TYPE II (brush- or spray-grade) and TYPE III (trowel-grade) can be used individually or in combination.
 - 2. Approved Equal: BASF MasterSeal 610/614/615 Waterborne Emulsified-Asphalt Dampproofing, for application by brush, trowel or spray.

2.04 LIQUID APPLIED BREATHABLE WATERPROOF COATING

- A. Sika Thorolastic®-750 water-based, 100% acrylic, elastomeric, waterproof coating with 300% elongation, in standard color selected by architect, and three textures. Apply per manufacturer's recommended standards for above-grade concrete, masonry, stucco and EIFS applications.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Carefully inspect installed work of other trades and verify work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.

3.02 INSTALLATION OF DAMP-PROOFING AND WATERPROOFING IN GENERAL

- A. Preparation: Prepare surfaces to receive damp-proofing and waterproofing, strictly complying with manufacturer's recommendations. Deliver waterproofing materials to project site in original sealed containers with manufacturer's brand and name clearly identified.
- B. Installation: Install damp-proofing and waterproofing complying with manufacturer's recommendations, covering surfaces to prevent penetration of moisture.

3.03 INSTALLING COLD-APPLIED MEMBRANE WATERPROOFING

- A. Priming: Apply primer to a cleaned, dust free surface. Apply by roller or spray. Apply Polyguard 650 LT Liquid Adhesive at the rate of 250-300 sq. ft. per gallon. Apply Polyguard ShurTac Water Based Liquid Adhesive at the rate of 350-400 per gallon. Allow to dry per manufacturer's directions.

B. Membrane Installation - Vertical Surfaces

1. All inside and outside corners shall be treated either with 12 inch wide membrane strip or by applying a 90 mil thick application of Polyguard LM-95. The 12 inch wide membrane should be centered over outside corners.
2. Install a 3/4 inch, 45 degree angle cant of Polyguard LM 95 Liquid Membrane at all changes in plane including inside corners.
3. Waterproofing membrane should be applied vertically in sections of 8 feet in length or less. On walls higher than 8 feet, apply two or more sections with the upper section overlapping the lower.
4. Side laps should be a minimum of 2 ½ inches and end laps should be a minimum of 6 inches.
5. Use a hard roller to firmly press in the material as it is placed on the vertical surface.
6. All terminations of the membrane should receive a bead of Polyguard 650 Mastic. The bead should be troweled to a flat surface approximately 1/8 inch thick by 3/4 inches wide. The mastic should be worked into cut edge terminations.
7. Inadequately lapped seams and damaged areas should be patched with small sections of membrane. The patch should extend a least 6 inches in each direction beyond the defect.
8. Fishmouths and severe wrinkles should be slit, flaps overlapped and repaired as above.
9. Termination bar at top termination of field sheet. (optional)

C. Membrane Installation - Horizontal Surfaces:

1. All inside and outside corners shall be treated either with 12 inch strips of membrane or a 12 inch wide by 90 mil thick application of Polyguard LM-95. The field membrane should be centered over the corner. All inside corners shall have a minimum 3/4 inch fillet of Polyguard LM-95 or latex modified cement mortar.
2. Waterproofing membrane should be applied to the primed surface starting at the low point and working to the high point in a shingling technique.
3. Side laps should be a minimum of 2 ½ inches and end laps a minimum of 6 inches.
4. The entire membrane should be firmly rolled with a linoleum roller weighing approximately 75 pounds. This will insure excellent adhesion and minimize air pockets between the substrate and membrane.
5. At penetrations, posts or projections, seal to the penetration with Polyguard LM-95 then apply a second flashing sheet over the penetration extending a minimum of 6 inches from the detail. The cut edges of all terminations must be sealed with Polyguard 650 Mastic.
6. At drains, apply Polyguard LM-95 around the inside edge of the drain out at least 6 inches then overlap with sheet membrane a minimum of 6 inches. All permanently exposed cut edge terminations must be sealed with Polyguard 650 Mastic.
7. Membrane turned up on walls shall be terminated into a reglet or under a counter flashing. The membrane may also be rolled firmly to the wall and sealed with a troweled bead of Polyguard 650 Mastic.

8. Inadequately lapped seams and damaged areas should be patched with small section of membrane. The patch area should extend a least 6 inches beyond the defect.
 9. Fishmouths and severe wrinkles should be slit, flaps overlapped and repaired as above.
 10. Upon completion of horizontal membrane application, flood test the surface with 2 inches of water for 24 hours. Check with the structural engineer to make sure the deck structure will withstand the weight of the flood test.
 11. Mark any leak areas found during flood test and make repairs.
- D. Install protection board immediately after installation of the membrane. Install protection board in a coating of compatible adhesive with edges butting tightly.

END OF SECTION 07 10 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install insulation and related items specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 PRODUCT HANDLING

- A. Protection:
1. Deliver materials to job site and store in safe dry place with labels intact and legible at time of installation.
 2. Protect building insulation materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

1.05 REFERENCES

- A. Concealed Installations: Flame Spread rating of not more than 75 and a smoke developed rating of not more than 450 when tested in accordance with ASTM E84.
- B. Exposed Installations: Flame Spread rating of not more than 25 and a smoke developed rating of not more than 450 when tested in accordance with ASTM E84.

PART 2 - PRODUCTS

2.01 RIGID PERIMETER INSULATION BOARD

- A. Where indicated as "Perimeter Insulation" at turn-down slab transitions, provide 2" thick Stryrofoam™ Brand Square Edge Extruded Polystyrene (XPS) Foam Insulation Shiplap, Owens Corning® FOAMULAR® 250, or approved equal. Insulation Minimum R-Value is to meet ASHRAE 90.1-2022 for heated Slab-On-Grade Floors of R-15 for 24 inches.
 - 1. Sopra-XPS by Soprema.US, 800-356-3521.
 - 2. Dupont™ Styrofoam™ Brand Cavitymate™ Ultra Extruded Polystyrene Insulation.
 - 3. Kingspan GreenGuard® Type IV XPS Insulation Board.
- B. Installation is to be per manufacturer's published recommendations.

2.02 UNBONDED LOOSEFILL INSULATION

- A. Provide PROPINK® L77 PINK® Fiberglas™ Insulation conforming to ASTM C764 Type I (pneumatic application) by Owens Corning Insulating Systems, LLC, 1-800-GET-PINK, or approved equal. Minimum Initial Installed Thickness to be 13.25 inches to achieve R-38 value in accordance with ASTM C687.
 - 1. Approved equals:
 - a. EcoFill® Wx Blowing Insulation as manufactured by Knauf Insulation.
 - b. INSULMAX® Blow-IN Cellulose Insulation.
 - c. Sanctuary® Cellulose Blow-in or Spray-Applied Insulation.
- B. Conform to the following current versions:
 - 1. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
 - 4. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

2.03 OTHER MATERIALS

- A. Provide materials including fasteners and retainers, not specifically described but required for complete and proper installation of building insulation, selected by Contractor subject to approval of Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Carefully inspect installed work of other trades and verify that work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.

3.02 INSTALLING OTHER INSULATION

- A. Install materials not specifically set forth above in strict accordance with manufacturer's instructions.

END OF SECTION 07 21 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install insulation and related items specified.
- B. Mineral wool insulation for the following applications:
 - 1. Thermal and acoustical insulation.
 - 2. Rainscreen/cavity wall continuous insulation.
 - 3. Multi-purpose thermal and acoustical insulation product used where fire-rated assembly is not required.
 - 4. Acoustical insulation for fire-rated interior partition walls and ceilings, unfaced.
 - 5. Perimeter fire-containment systems.
 - 6. Fire-resistant joint systems in rated assemblies.
 - 7. Firestopping of through penetrations in rated assemblies.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Verification Samples: Submit representative sample for each finished product specified.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Shall have experience installing similar assemblies.
- B. Mock-Up: If requested, provide a mock-up of materials proposed for use for review of workmanship. Accepted mock-ups may remain in place.
- C. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this section. Agenda shall include, at a minimum, materials proposed for use, sequence of construction, coordination with substrate preparation, compatibility of materials, and coordination with installation of adjacent and covering materials. Attendance is required by representatives of related trades, including covering materials, substrate materials, and adjacent materials.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to the job site in original packages, containers, or bundles bearing the brand name and manufacturer's identification.
- B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.
- C. Handling: Handle using procedures recommended by the manufacturer for materials and personnel.

1.05 WARRANTY

- A. Warranty: Provide manufacturer's standard limited warranty against manufacturing defects.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Basis-of-Design Manufacturer: Thermafiber, Inc. (an Owens Corning® company), One Owens Corning Parkway, Toledo, OH 43659. Toll free 888-834-2371, Fax 260-563-8979, or www.owenscorning.com.
- B. Approved Equal: ROCKWOOL (US) 4594 Cayce Drive, Byhalia, MS 38611 1-877-823-9790 or at www.rockwool.com

2.02 MULTI-PURPOSE THERMAL AND ACOUSTICAL INSULATION PRODUCT USED WHERE FIRE-RATED ASSEMBLY IS NOT REQUIRED

- A. Product: Thermafiber® VersaBoard®, non-combustible, semi-rigid mineral wool insulation board, water-repellent. Fire-resistant to temperatures above 2,000 degrees F.
 - 1. Facing: Unfaced.
 - 2. Facing: ASJ facing.
 - 3. Facing: Black mat.
 - 4. Facing: White mat, Flame Spread 25 and Smoke Developed 5.
 - 5. Facing: White foil, Flame Spread 25 and Smoke Developed 0.
 - 6. Surface Burning Characteristics: Tested in accordance with ASTM E84. Unfaced, Flame Spread 0 and Smoke Developed 0. Foil-faced, Flame Spread 25 and Smoke Developed 0.
- B. Product: Thermafiber® VersaBoard® 35, complies with ASTM C612 Type IA.
 - 1. R-Value: 4.2 per inch.
 - 2. Density: 3.5 pcf (actual).

- C. Product: Thermafiber® VersaBoard® 40, complies with ASTM C612 Types IA, IB, II, III, and IVA.
 - 1. R-Value: 4.3 per inch.
 - 2. Density: 4.0 pcf (actual).
- D. Product: Thermafiber® VersaBoard® 60, complies with ASTM C612 Types IA, IB, II, III, and IVA.
 - 1. R-Value: 4.3 per inch.
 - 2. Density: 6.0 pcf (actual).
- E. Product: Thermafiber® VersaBoard® 80, complies with ASTM C612 Types IA, IB, II, III, and IVA.
 - 1. R-Value: 4.3 per inch.
 - 2. Density: 8.0 pcf (actual).
- F. Moisture-Resistance: Absorption of less than 0.03% by volume, when tested in accordance with ASTM C1104.
- G. Corrosivity: Non-corrosive, when tested in accordance with ASTM C665.
- H. Fiber Type: EPA Choice fiber; minimum 75% pre-consumer recycled content; complies with EPA Preference Program.
- I. Fiber Type: Standard fiber; 70% pre-consumer recycled content.
- J. Post-Consumer Recycled Content: 0%.
- K. UL Certified Environmental Product Declaration in accordance with ISO 14025.

2.03 OTHER MATERIALS

- A. Provide materials including fasteners and retainers, not specifically described but required for complete and proper installation of building insulation, selected by Contractor subject to approval of Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions under which work of this section will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install insulation in accordance with approved submittals, manufacturer's written recommendations, and guidelines.

- B. Install insulation to maintain continuity of thermal protection to building elements and spaces.
- C. Comply with tested and listed systems.

3.03 PROTECTION

- A. Protect installed products from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 10

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PART 1 - GENERAL

1.01 SUMMARY

- A. Work under this section consists of furnishing all labor, materials, equipment and services necessary for and incidental to the complete and proper installation of all non-structural blown/loose-fill thermal material and related work shown on the drawings and specified herein.
- B. **Related Work:** All electrical, plumbing, and mechanical penetrations must be completed prior to application. Air sealing, either fire-resistance rated or non-fire-resistance rated, must be completed where required as well. Follow all Code and local jurisdiction requirements in the application of these products.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Submit product data that the product meets or exceeds the following specified requirements.
- D. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

1.04 REFERENCE

- A. American Society for Testing and Materials (ASTM).
 - 1. E 84-10 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. C 518-10 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. C 739-08 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
 - 4. E 970-10 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

5. C 1149-08 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation.
 6. E 136-09b Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
 7. C 1015-06 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 8. E 119-10a Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Consumer Products Safety Commission (CPSC) 16 CFR Part 1209, Interim Safety Standard for Cellulose Insulation, and 16 CFR Parts 500 and 1404 where applicable.
 - C. Federal Trade Commission (FTC) 16 CFR Part 460, Labeling and Advertising of Home Insulation.
 - D. Environmental Protection Agency (EPA) 40 CFR Part 247.12 Comprehensive Procurement Guideline For Products Containing Recovered Materials.
 - E. Underwriters Laboratories (UL) Product Classification Marks are found on all bags.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver material in original unopened packages, fully identified as to manufacturer, brand or other identifying data and bearing the proper Underwriters Laboratories, Inc. labels for Surface Burning Characteristics. Store material off ground, under cover, in a dry place until use. All bags that have been exposed to water before use are unsuitable and will be discarded.
- B. Insulation package labels include a production code that indicates date and place of manufacture, and all required current statutory and classification marks.

1.05 LIMITATIONS

- A. Avoid heating the work area with propane or kerosene space heaters. Use electric heaters and ventilation to avoid adding excessive moisture vapor to the building envelope.
- B. Do not install insulation where it may be exposed to rain or ground water. Do not install insulation in contact with masonry walls below grade. In any application where insulation's products may be exposed to high humidity, a detailed moisture control design must be used.
- C. Do not allow insulation to contact any surface above 194°F (90°C).

- D. Keep insulation away from exhaust flues of furnaces, water heaters, space heaters, chimney flues or other heat or combustion producing devices. ASTM C 1015-06 recommends that a minimum of three inches of air space should be maintained between the insulation and heat source. Do not install insulation products around heat or ignition sources or operations such as welding, metal cutting, grinding or other potentially flammable situations.
- E. Specified insulation is not classified as noncombustible according to ASTM E 136-09b.
- F. Specified insulation products may not be used in thermal insulation applications where there is not an approved coverage chart on the bag. Some applications do not require the use of a thermal insulation coverage chart. Specified insulation products can be used in these applications provided manufacturer's installation instructions and all other applicable Code, fire safety and other requirements are met.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate application of material with work in other sections which would interfere with efficient application.

1.07 QUALITY ASSURANCE

- A. Manufacturer must have a current Underwriters Laboratories (UL) Code Evaluation Report.
- B. Manufacturer must be in compliance with the 2009 and 2012 International Building Code.
- C. Manufacturer must be ISO 9001:2015 Certified.
- D. Applicator: Licensed by manufacturer.
- E. Manufacturer must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.
- F. Mock-up: Apply a 100 square foot representative sample to be reviewed by the Architect and/or Owner prior to proceeding.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Greenfiber®, 5500 77 Center Drive, Suite 100, Charlotte, NC 28217.
Toll Free: (800) 228-0024. Website: <https://www.greenfiber.com>
 - 1. Approved equal manufacturers:
 - a. Knauf Insulation, (800) 825-4435 ext. 8576.
Website: <https://www.knaufnorthamerica.com/en-us>
 - b. Nu-Wool Insulation, (800) 748-0128; Website: <https://nuwool.com>

2.02 MATERIALS: SANCTUARY® Cellulose Insulation or approved equal.

- A. Complies with 16 CFR Parts 460, 500, 1209 and 1404, ASTM C 1149-17, ASTM C 739-21, ASTM C 518-21, ASTM E 970-17, ASTM E 84-20.
- B. Surface Burning Characteristics:
 - 1. ASTM E 84-20: Flame spread <25, Smoke Developed Index <50.
- C. SANCTUARY, when used in fire-resistance rated wall assemblies, are allowed to increase the fire-resistance rating by fifteen (15) minutes per IBC 2021 Table 722.6.2(5) provided the cavity is completely filled with a minimum density of 2.6 pounds per cubic foot.
- D. Complies with all building code requirements for cellulose fiber thermal insulation. Provide ICC ESR2021 or CCMC Listings 12911-L and 13162-L as required.
- E. Complies with EPA 40 CFR Part 247.12.
- F. No asbestos, mineral fibers, or formaldehyde are used in the manufacturing process.
- G. Thermal Performance:
 - 1. ASTM C 518-21, thermal performance varies with density and thickness. See the appropriate product coverage chart to calculate the R-value per inch if needed. All C 518-21 testing is done at a representative thickness of 4”.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work will be installed.
 - 1. Install or verify proper installation of attic rafter vents and baffles before insulation is blown.
 - a. Manufacturer: ADO Durovent Baffle® DVB152346 or approved equal.
Tel.: (800) 666-8191. Email: sales@adopproducts.com
- B. Verify adjacent materials are dry and ready to receive insulation.
- C. Verify mechanical, plumbing, and electrical services within walls have been inspected.
- D. Provide a written report to the architect, builder or general contractor listing conditions that require correction prior to installation.
- E. Do not proceed with installation until conditions as identified in 3.01-D have been corrected.

3.02 PREPARATION

- A. Remove any loose dust, dirt, foreign material, or films that may impair adhesion to application surfaces.
- B. Verify adhesion requirements and compatibility of all surfaces to receive thermal insulation materials.
- C. Protect all nearby surfaces that are not intended to receive thermal insulation, e.g., outlets, windows, and doors.
- D. Make sure there are no assembly details that appear to be preventing the application of the product per the manufacturer's instructions.

3.03 INSTALLATION

- A. Read, understand and comply with manufacturer's instructions for particular conditions of installation.
- B. Wear proper clothing and eye protection.
- C. For breathing protection, use a NIOSH approved N95 or higher disposable or reusable particulate respirator per 29 CFR 1910.134.
- D. The work shall be coordinated with other trades whose work may be affected by, or have an effect on, the installation.
- E. SANCTUARY Spray-applied and Stabilized Insulation shall be installed with equipment specifically designed for its application.
- F. Drying time varies due to local climate conditions including temperature, humidity, and the installed moisture. Do not cover the insulation until the insulation moisture levels, measured, and documented after a minimum period of 24 hours from the time of installation, reach a moisture reading of 25 % or less in accordance with SANCTUARY'S Wall Spray Manual.

3.04 CLEAN-UP

- A. Remove sprayed material from surfaces not specifically required to be insulated.
- B. Broom-clean work areas affected by the work of this section.

3.05 DOCUMENTATION

- A. The installer must provide a completed SANCTUARY Attic Card with the installed thickness and R-value claims or other documentation of the installation quality and performance, per 16 CFR Part 460. The installer must also apply attic rulers where appropriate per Code and FTC requirements.

- B. When installing SANCTUARY as spray-applied, record the data on a quality control moisture measurement control log, as included in the SANCTUARY Wall Spray Manual.
- C. When installing SANCTUARY as stabilized insulation for attics, record the data on a quality control moisture measurement control log.

END OF SECTION 07 21 29

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide combination wall sheathing, water-resistive barrier, and air barrier panel system, including accessories required for proper completion of work.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of demonstrating that all wood procurement operations are conducted in accordance with procedures and policies of the Sustainable Forestry Initiative (SFI) Program.
- B. Roof sheathing meeting requirements for roof underlayment in accordance with ICC-ES AC266 Wood Structural Panel Roof Sheathing Factory-laminated with an Alternative Roof Underlayment.
- C. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council (ICC), ICC-ESR1474 (ZIP System Wall Sheathing).
 - 2. International Code Council (ICC), ICC-ESR2227 (ZIP System Tape).

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Outdoor Storage: Comply with manufacturer's recommendations.
 - 1. Set panel bundles on supports to keep off ground.
 - 2. Cover panels loosely with waterproof protective material.
 - 3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
 - 4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.08 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which sheathing manufacturer agrees to repair or replace sheathing products that demonstrate deterioration or failure under normal use due to manufacturing defects within warranty period specified, when installed according to manufacturer's instructions.
 - 1. Warranty Period for Sheathing Products: 30 years from date of Substantial Completion.
- B. Leak Free Limited Warranty: Manufacturer's warranty indicating ZIP System® roof assembly will not leak for the period of 5 year from the date of installation, when installed in accordance with manufacturer's recommendations and requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Huber Engineered Woods LLC, Charlotte NC; Phone: (800) 933-9220.
Website: www.huberwood.com

2.02 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory".
- A. Fire-Test-Response Characteristics:
 - 1. Exterior Fire-Test Exposure (Roof sheathing): Where indicated provide approved products that are part of fire-resistance-rated assemblies with approved Class A coverings, tested in accordance with ASTM E108 - Standard Test Methods for Fire Test of Roof Coverings
- B. Water-Vapor Permeance, Facer: Minimum 12 perms (689 ng/Pa x S x SQ. M), when tested in accordance with ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

2.03 WOOD PANEL PRODUCTS

- A. Oriented Strand Board: US Department of Commerce DOC PS 2 - Performance Standard for Wood-Based Structural Panels
 - 1. Panels made with binder containing no added urea formaldehyde.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated. Thickness shall satisfy minimum and maximum requirements for referenced performance category.

- C. Panel Exposure: No damage from weather exposure for up to 180 days.
- D. Printed fastener spacing symbols on facer for 16-inch and 24-inch on center spacing.

2.04 COMBINATION WALL SHEATHING, WATER-RESISTIVE BARRIER, AND AIR BARRIER

- A. Oriented-Strand-Board Wall Sheathing: With integral water-resistive barrier, Exposure 1 sheathing.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC, ZIP System Wall Sheathing or a comparable product by one of the following:
 - a. LP WeatherLogic® Air & Water Barrier.
 - b. Georgia-Pacific ForceField® Weather Barrier System.
 - 2. Span Rating, Panel Grade and Performance Category: Not less than 24/16; Rated Sheathing; 7/16 Performance Category.
 - 3. Edge Profile: Square edge.
 - 4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches and 24-inches on centers spacings.
 - 5. Performance Standard: DOC PS2-10 and ICC-ES ESR-1474.
 - 6. Factory laminated integral water-resistive barrier facer.
 - 7. Perm Rating of Integral Water-Resistive Barrier: 12-16 perms.
 - 8. Assembly maximum air leakage of 0.0072 cfm/sq. ft. infiltration and 0.0023 cfm/ sq. ft. exfiltration at a pressure differential of 1.57 psf.
 - 9. Exposure Time: Designed to resist weather exposure for 180 days.

2.05 ROOF SHEATHING WITH INTEGRAL AIR AND MOISTURE

- A. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural 1 sheathing with factory-laminated water-resistive barrier facer with printed fastener location symbols.
 - 1. Basis-of-Design: Huber Engineered Woods LLC; ZIP System® roof sheathing.
 - 2. Characteristics
 - a. Span Rating, Panel Grade and Performance Category: Not less than 24/16; Structural 1; 7/16 Performance Category.
 - b. Edge Profile: Tongue-and-Groove and square-edge along 4 ft edges.
 - c. Exterior Surface Facer: Medium-density, phenolic-impregnated kraft paper overlay in accordance with ICC-ES AC266 - Wood Structural Panel Roof Sheathing Factory-laminated with an Alternative Roof Underlayment.

2.06 SHEATHING FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. Nails, Brads, and Staples: Conform with ICC-ES AC116 - Acceptance Criteria for Nails and Spikes and ICC-ES AC201 Acceptance Criteria for Staples.
- C. Power-Driven Fasteners: ICC-ES ESR-1539 - Power Driven Staples and Nails for Use in Engineered and Non-Engineered Connections or ICC-ES NER-272 - Power Driven Staples and Nails for Use in All Types of Building Construction.

2.07 PEEL AND STICK UNDERLAYMENT

- A. Peel and stick roofing membranes, fulfilling code requirements for ice barrier and underlayment on roofs with slopes 2:12 or greater. Underlayment to be used on entire roof surface.
 - 1. Basis-of-Design: Huber Engineered Woods LLC; ZIP System™ peel and stick underlayment HT products
 - 2. Characteristics:
 - a. Adhesive Technology: Rubberized Asphalt
 - b. Thickness: 40 mils
 - c. Backing Material: (Underlayment HT) Polymeric film
 - d. Exposure Period: (Underlayment HT) 120 days.
 - e. Maximum Service Temperature: (Underlayment HT) 260 degrees F.
 - f. Permeance: less than or equal to 0.05 perms

2.08 ACCESSORY PRODUCTS

- A. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials, and tested as part of an assembly meeting performance requirements.
 - 1. Basis-of-Design: Huber Engineered Woods; ZIP System™ flashing tape.
 - 2. Characteristics
 - a. Adhesive type: Acrylic
 - b. Thickness: 0.012 inch
 - c. Tensile Strength: 938 psi
 - d. Elongation: 400-800 percent
 - e. Complies with AAMA 711 - Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration and ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.
- B. Self-Adhering Flexible Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive; tested as part of an assembly meeting performance requirements.
 - 1. Basis-of-Design: Huber Engineered Woods; ZIP System™ stretch tape.
 - 2. Characteristics
 - a. Adhesive type: Acrylic
 - b. Thickness: 0.042 inch
 - c. Tensile Strength: 225 psi
 - d. Elongation: 800-1200 percent

- e. Complies with AAMA 711 - Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration and ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials
- C. Liquid-Applied Flashing Membrane (Wall Sheathing): Gun-grade, cold-applied, silyl-terminated polyether (STPE) liquid flashing membrane compatible with sheathing/weather barrier and self-adhering seam and flashing tape, and tested as part of an assembly meeting performance requirements. Follow manufacturer's recommendation for integration with ZIP System Tape.
 - 1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Liquid Flash or a comparable product by one of the following:
 - a. 3M All Weather Flashing Tape 8067.
 - b. SIGA Wigluv 150 (6").
 - 2. Hardness, Shore A, ASTM C 661: 40 to 45
 - 3. Total Solids: 99 percent
 - 4. Tensile Strength, ASTM D412: 75 psi

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing spacing and alignment to determine if work is ready to receive sheathing. Proceed with sheathing work once conditions meet requirements.

3.02 WALL INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. ICC-ES ESR-1539 or NES NER-272 for power-driven fasteners.
 - 2. Chapter 23 in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

- E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Only mechanically attached and drainable EIFS and exterior insulation should be used with ZIP System wall sheathing.

3.03 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in American Wood Council, "ASD/LRFD Manual for Engineered Wood Construction," 2012 edition for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall Sheathing:
 - a. Nail or staple to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8-inch apart at edges and ends.
 - d. Install fasteners 3/8-inch to 1/2-inch from panel edges.
 - e. Space fasteners in compliance with requirements of authority having jurisdiction.

3.04 WALL SHEATHING JOINT TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply ZIP System proprietary seam tape to joints between sheathing panels.
 - 2. Utilize ZIP System tape gun or hard rubber roller provided by manufacturer to ensure tape is completely adhered to substrates.
 - a. When using ZIP System Liquid Flash to seal sheathing joints, follow manufacturer's recommendations for sealing panel seams.

3.05 FLEXIBLE FLASHING (WALL) INSTALLATION

- A. Apply ZIP System Tape flexible flashing or ZIP System Liquid Flash liquid applied flashing membrane where indicated to comply with manufacturer's written instructions.
 - 1. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
 - 2. Width of Flexible Flashing: 6 inch.
 - a. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer's written instructions. Follow manufacturer's recommendation for integration with ZIP System Tape.

3.06 ROOF SHEATHING INSTALLATION

- A. General: Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.
 - 1. Do not bridge expansion joints; allow joint spacing equal to spacing of structural supports.
 - 2. Install panels with laminated facer to exterior. Stagger end joints of adjacent panel runs. Support all panel edges.
 - 3. Panel Edge Spacing: Sheathing panel manufacturer's recommendations
 - 4. Attach sheathing panels securely to substrate with manufacturer-approved fasteners in compliance with the following:
 - a. ICC-ES ESR-1539 - Power Driven Staples and Nails for Use in Engineered and Non-Engineered Connections or ICC-ES NER-272 - Power Driven Staples and Nails for Use in All Types of Building Construction
 - b. ICC IBC - International Building Code Table 2304.9.1 Fastening Schedule.
 - 5. Install Roof Sheathing Panel Clips where required under code approvals based upon panel thickness and support spacing, provide panel clips located at each unsupported panel butt joint centered between supports.

3.07 ROOF SHEATHING SEAM AND PENETRATION TREATMENT

- A. Assembly continuity: Coordinate sheathing installation with flashing and joint sealant sequencing and installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.
- B. Tape panel seams, penetrations, and facer defects or cracks with self-adhering seam tape to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-ES applicable to tape application.
- C. Tape openings and radius penetrations with self-adhering flexible flashing tape to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-AC applicable to tape application.

3.08 ROOF UNDERLAYMENT INSTALLATION

- A. Prior to installation of peel and stick underlayment, confirm sheathing has been installed and fastened in accordance with sheathing manufacturer's recommendations.
- B. Ensure substrate for peel and stick underlayment is dry and free of dirt, debris, or frost.

- C. Install ZIP System™ peel and stick underlayment in accordance with:
1. Huber Engineered Woods' published installation instructions.
 2. ICC-ES ESR 4904
 3. Requirements of local building codes or authorities having jurisdiction.
 4. Where installation instructions of the above are not in agreement, utilize the most restrictive requirements.

END OF SECTION 07 27 23

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, material, tools, equipment and services required and in accord with provisions of Contract Documents.
- B. Completely coordinate with work of all other trades.
- C. Although such work 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.
- D. Related Work Specified Elsewhere
 - 1. Roof Deck structural steel, flat roof systems, perimeter edge systems. Roof hatches, firestopping not included in this section.
- E. Material to comply with:
 - 1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
 - 1. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.
- C. Shop drawings: Show fabrication and installation layouts of metal roof panels, metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work

- D. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved:
1. Roof panels and attachments, including thermal spacer blocks.
 2. Metal trusses, bracings and supports
 3. Roof-mounted items including snow guards and items mounted on roof curbs.

1.04 QUALITY ASSURANCE

- A. Applicable Standards:
1. SMACNA: "Architectural Sheet Metal Manual", Sheet Metal and Air Conditioning Contractors National Association, Inc.
 2. LGSI: "Light Gage Structural Institute"
 3. AISC: "Steel Construction Manual", American Institute of Steel Construction.
 4. AISI: "Cold Form Steel Design Manual", American Iron and Steel Institute (1996 Edition).
 5. UL580: "Tests for Uplift Resistance of Roof Assemblies", Underwriters Laboratories, Inc.
 6. FM: "Test Requirements for Class 1 panel roofs", Factory Mutual Research Corporation.
 7. UL2218: Class 4 Impact Resistance Rating
 8. 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.
 9. ASTM E 1680: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems", American Society for Testing and Materials.
 10. ASTM E 1646: "Standard Test Method for Water Penetration Through Exterior Metal Roof Panel Systems", American Society for Testing and Materials.
 11. ASTM A 792-83-AZ50 (Painted) & ASTM A792-83-AZ55 (Bare Galvalume Plus®): "Specifications for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process, General Requirements (Galvalume®)", American Society for Testing and Materials.
 12. ASTM E 1514-98 (2017): "Standard Specification for Structural Standing Seam Steel Roof Panel Systems", American Society for Testing and Materials.
 13. ASTM E 408-71: Standard Test Method for Total Normal Remittance of Surfaces Using Inspection- Meter Techniques. (Energy Star for Roof Products).
 14. ASTM E 903-96 Standard Test Method for Solar Absorptions, Using Integrating Spheres. (Energy Star for Roof Products)
 15. ANSI/SPRI/FM 4435/ES-1-11 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems", and NRCA Guidelines for Complying With Building Codes Using ANSI/ SPRI ES-1. Provide shop drawings, to include wood blocking, to meet this standard or certified third party test data for gravel stop, fascia profiles and coping. Refer to the drawings for design wind load parameters. Include wind loads for roof area perimeters and corners on submittals.

- B. Manufacturer's Qualifications:
 - 1. Manufacturer has a minimum of five years experience in manufacturing metal roof systems of this nature. Panels specified in this section shall be produced in a factory environment (not with a portable roll former) with fixed-base roll forming equipment and in line leveling, assuring the highest level of quality control. A letter from the manufacturer certifying compliance will accompany the product material submittals.
- C. Installation Contractor's Qualifications:
 - 1. Installation contractor shall be an approved installer, certified by the manufacturer before the beginning of installation of the metal roof system.
 - 2. Project foreman is the person having received certification by the manufacturer specific training in the proper installation of the selected metal roof system and will be present to supervise whenever material is being installed.
 - 3. Provide certification letter that installation contractor has a minimum of three years' of metal product installation experience immediately preceding the date upon which work is to commence.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to installation of roofing system, conduct a pre-installation conference at the project site. Verify responsible provider and installer of thermal spacer blocks and sequencing.
- B. Attendance: Owner, Architect, Contractor, Project Superintendent, and Certified Installer.
- C. Agenda:
 - 1. Roofing details and agenda
 - 2. Critical work sequencing and review of phasing plan
 - 3. Inspection sequencing

1.06 WARRANTY

- A. Manufacturer Warranties:
 - 1. Panel Material: Furnish manufacturers 25 year warranty covering the panel against rupture, structural failure, or perforation.
 - 2. Panel Coating: Furnish manufacturer's 40-year warranty panel coating warranty covering cracking, checking, and peeling, and 30 year warranty covering fade and chalk.
 - 3. Metal Roof Weathertightness Warranty:
 - a) Manufacturer's Single Source Weathertightness Warranty
 - (1) Warranty term: 20 years commencing on date of substantial completion.
 - (2) Total manufacturer's liability: NRL (No Repair Limit) / SF.
 - (3) Warranty must cover: Pipe and Curb Penetrations; Wind Speeds up to 75 mph
 - (a) Pipes must be centered in pan or a pipe curb must be used. Pipe must be flashed with an EPDM dektite.

- (b) Curbs must be all welded aluminum or stainless steel.
 - (c) Manufacturer must supply engineered installation drawings signed and sealed by an engineer registered in the state in which the project is located.
- B. Installer Warranty: Installer to provide warranty agreeing to repair or replace metal roof panels, trim, or accessories that fails due to poor workmanship or faulty installation.
 - 1. Warranty term: 2 years commencing on date of substantial completion.
- C. Special Warranty on Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested in accordance with ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 30 years from date of Substantial Completion.
- D. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

1.07 PRODUCT HANDLING

- A. Protection: Protect roofing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide systems by PAC-Clad or equivalent system by one of the following manufacturers:
 - 1. AEP Span
 - 2. Berridge
 - 3. Exceptional Metals
 - 4. McElroy Metal
 - 5. Metal Sales
 - 6. MBCI

2.02 VERTICAL LEG STANDING SEAM METAL ROOF SYSTEM

- A. PAC-Clad PAC-150 180° Seam, Smooth Panel (Standard), 1-1/2 inch high x 3/8" to 1/2" inch wide rib x 12" wide panel. Mechanically seamed 24 gauge steel.
- B. Metal Roof System Style: Vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot-melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
- C. Gauge: 24 Gauge Steel.
- D. Substrate: ASTM A792, AZ50 Galvalume steel sheet, minimum yield of 50,000 PSI.
- E. Clip: Two piece floating clip, 18 gauge base, 24 gauge top, with factory applied mastic.
 - 1. UL-90 rated - Underwriters Laboratories.
- F. Finish: Finish to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation. Color to be selected by Architect from manufacturer's complete line.
 - 1. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
- G. Prefabricated Roof Jacks:
 - 1. SFS - iNTECH - Wyomissing, PA.
 - 2. ITW Buildex - Itasca, IL.
- H. Roof Ventilation Systems:
 - 1. Provide V-600® continuous Ridge Vent as manufactured by Cor-A-Vent, Inc. Tel.: (800) 837-8368.
- J. Snow Retention System:
 - 1. Provide 1" Sno Blockade™ Snow Retention System by Sno Gem, (1-888-766-4367) with the Sno Gem Sno Cube™ attachment bar system and "Blockade Plate™ for sliding snow and ice, spaced as recommended by manufacturer. Provide clamp style to coordinate with roof seam profile being proposed. Provide installation details to Architect for review prior to installation.
 - 2. Finish: Components to match the same paint finish color as the metal roof panels.
 - 3. Approved Equal Manufacturers:
 - a. S-5! ColorGard by Metal Roof Innovations, Ltd., 888-825-3432.
- K. Underlayment (Peel and Stick): 45 mil self-adhering ice and water shield membrane as manufactured by Mid-States Asphalt to be QUIK-Stick FS (Film Surface) High Temperature (textured film surface), or approved equal. Install per manufacturer's written recommendations over entire roof surfaces, including valleys. DO NOT impede air flow at ridge vent configurations, if applicable, and ensure attic ventilation throughout.

2.03 MISCELLANEOUS MATERIALS

- A. Fasteners:
 - 1. All self-tapping/self-drilling fasteners, bolts, nuts, self-locking rivets and other suitable fasteners shall be designed to withstand specified design loads.
 - 2. Use long life fasteners for all interior and exterior metal roof system applications.
 - 3. Provide fasteners with a factory applied coating in a color to match metal roof system application.
 - 4. Provide neoprene washers under heads of exposed fasteners.
 - 5. Locate and space all exposed fasteners in a true vertical and horizontal alignment. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

2.04 ACCESSORIES

- A. Provide all components required per the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers and any other required items.
 - 1. All outside closures will be fabricated from Pre-Painted Galvalume sheet steel of the same gauge, finish and color as the panels.
 - 2. All tape seal is to be a pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
 - 3. All joint sealant is to be a one-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.

2.05 FABRICATION

- A. Material shall be in-line leveled prior to roll forming panel profile.
- B. Where possible, roll form panels in continuous lengths, full length of detailed runs.
- C. Standard panel length shall be no more than 50 feet long.
- D. Fabricate trim/flashing and accessories to detailed profiles. If not detailed, submit standard profiles available for selection by Architect.
- E. Fabricate trim/flashing from same material as panel.

2.06 PREFABRICATED ROOF JACKS

- A. Pipe flashings shall be a one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of -65°F to 212°F (for standard applications) or silicone molded rubber boot having a serviceable temperature range of -100°F to 437°F (for high temperature applications) and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring. **Do not install pipe flashings through any panel seams - install ONLY in the flat portion of the panel.**

2.07 SOFFIT PANELS

- A. Provide "PAC-850" with hook and grab interlock by Peterson Aluminum Corporation, 1-800-441-8661 or approved equal, 1/2" deep x 12" wide, roll-formed from .032 aluminum. Provide one-half vented panels for 20% of the total installation. Refer to Reflected Ceiling Plan. Mix and match: Use solid panels to fill remaining eave space.
- B. Provide panels with male and female side configurations to form a locking assembly when joined to adjacent panels. Provide manufacturer's standard concealed attachment method.
- C. Finish to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation. Color to be selected by Architect from manufacturer's standard line.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examination: Inspect installed work of other trades and verify that such work is complete to a point where this work may continue. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying that secondary structural members and/or decking are installed to meet UL and building code requirements. Coordinate with metal roof system manufacturer to insure that reduced clip spacings at eave, rake, ridge and corner areas are accommodated.
- B. Discrepancies: In event of discrepancy, notify the architect. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

- A. Install metal roof system so that it is weather-tight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install metal roof system in accordance with manufacturer's instructions and shop drawings.

- C. Provide concealed anchors at all panel attachment locations.
- D. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.

3.03 CLEANING, PROTECTION

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions with touch up paint supplied by the metal roof system manufacturer.
- E. Do not allow panels or trim to come in contact with dissimilar metals such as copper, lead or graphite. Water run-off from these materials is also prohibited. This specifically includes condensate from roof top A/C units.
 - 1. Separate dissimilar metals from each other by painting each metal surface in area of contact with a bituminous coating, or by applying adhesive polyethylene underlayment to each metal surface, or by permanent separation as recommended by manufacturer.

END OF SECTION 07 41 13

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of metal panels is shown on the drawings and indicated by provisions of this section.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Installer must have minimum of three years successful experience with installation of metal panels of type and scope equivalent to work of this section.
- B. Except as otherwise shown or specified, comply with applicable recommendations and details of "Architectural Sheet Metal Manual" by SMACNA. Conform to dimensions and profiles shown. Manufacturer to provide trained metal craftsmen to supervise installation.
- C. Comply with ASTM E1592-94 - Structural performance of sheet metal siding by uniform static air pressure difference.

1.05 WARRANTY

- A. Provide manufacturer's guarantee for exterior color finish for panels for a period of 25 years against blistering, peeling, cracking, flaking, checking, chipping and excessive color change and chalking. Color change not to exceed 5 NBS units (per ASTM D-2244.64T) and chalking not less than rating of 8 per ASTM D-659.
- B. Panel Manufacturer: Furnish manufacturer's standard warranty to cover material for repairs to stop leaks resulting from natural deterioration of any component of the assembly including all flashing and trim installed as a part of the system. A specimen of the warranty shall be submitted for Architect's review prior to starting application. Warranty is to be in effect from Final Acceptance Date.

- C. Furnish written guarantee signed by installer guaranteeing the installation of the panels to remain intact and free from leaks for two years following substantial completion date.

1.06 PRODUCT HANDLING

- A. Protection: Protect materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary to approval of Architect and at Contractor's expense.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide systems by PAC-Clad Petersen Aluminum Corp. or equivalent system by one of the following manufacturers:
 - 1. Atas
 - 2. Berridge
 - 3. Exceptional Metals
 - 4. McElroy Metal
 - 5. Metal Sales
 - 6. PAC-Clad Petersen Aluminum Corp.
 - 7. MBCI

2.02 WALL PANELS

- A. Box-Rib-Profiles, Concealed Fastener Metal Panels:
 - 1. Basis of Design: PAC-CLAD Precision Series Wall Panels.
 - a. BR-1: Box Rib 1
 - 2. Coverage Width per Panel: 12 inches nominal
 - 3. Continuous Rib Spacing: Varies with each Box Rib profile.
 - 4. Rib Height: 1-3/8 inch
 - 5. Nominal Coated Thickness: 24 gage steel.
 - 6. Panel Surface: Smooth.
 - 7. Exterior Finish: Fluoropolymer two-coat system.
 - 8. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
 - 9. Color: Architect to select from manufacturer's complete line.
- E. Finish for wall panels to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect.
 - 1. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.

2.03 ENDLAPS

- A. Pre-punch endlaps and provide an 18 gauge pre-punched backup plate and a 16 gauge pre-punched cinch strap for proper placement of fasteners.
- B. Apply mastic between the panels and secure with self tapping fasteners through the cinch strap, panels and backup plate to form a compression joint.

2.04 FASTENERS

- A. Provide manufacturer's recommended Lifetime self-drilling exposed fastening method.
 - 1. Panel Fasteners For panel to panel and panel to purlin connections to be No. 12-14 by 1 in. self-drilling, self tapping, hex head, plated steel screws with a 5/8 in. OD formed steel washer and a neoprene sealing washer.
 - a. Alternate Fasteners - For panel to purlin connections, 1/4 - 14 HHAB self-tapping, plating steel screws, with a separate 5/8 in. OD dome shaped steel washer and a neoprene sealing washer may be used.
 - b. No. 14-10HHA, self-tapping, plating steel screws, with a separate, 5/8 in. OD dome shaped steel washer and a neoprene sealing washer may be used.
 - 2. Spacing, for panel - to - purlin connections to be 12 in. on center beginning 2 - 1/2 in. from center line on one side of each major rib. Spacing at end lap to be in a 5 - 7 - 5 - 7 in. pattern beginning 2 - 1/2 in. from the center line on both sides of each major rib.
 - 3. Fastener for panel to purlin connection to be 1-1/4 in. long when insulation is greater than 4-1/2 in. Spacing for panel - to - panel connections to be 20 in. on center with a fastener located in line with the purlin fasteners

2.05 SEALANTS AND CLOSURES

- A. Factory applied sidelap sealant is to be non-drying synthetic polymer based, designed for metal to metal concealed joints.
- B. Field applied panel end sealant is to be extruded polymeric butyl tape.
- C. Manufacture outside closures from same material as wall panel.
- D. Manufacture inside closures from 18 gauge metal or neoprene.

2.06 FLASHING, TRIM AND ACCESSORIES

- A. Flashing shall not compromise the integrity of the wall system by constricting movement due to thermal expansion and contraction.
- B. Finish to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation to match wall panels.
 - 1. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.

- C. Panel manufacturer to supply flexible membranes if applicable.
- D. Manufacture all trim and flashing from Galvalume sheet steel.
- E. All penetrations shall be flashed by panel installer and become a part of the panel manufacturer's weathertightness warranty.
- F. Stock Hat Channel for Cladding Support:
 - 1. Galvanized G90 Solid / Vented, 18ga / 16ga for exterior cladding applications.
 - a. Vented hat channels shall be use in horizontal orientation where vertically oriented exterior cladding is detailed to allow for moisture mitigation, maintaining a drained and ventilated cavity.
 - b. Hat channels can be installed in a number of ways depending on the cladding needs. Where hat channels are used as furring, behind a concealed fastener system, they can be oriented in either direction. In an installation where there are exposed fasteners, they can also be installed either direction, and sometimes in both directions to allow for panels to share hat channels. Channels project out 1".
 - c. 16ga hat channels to be used where a heavier duty panel, or more durable support system is required. Use 18ga for lighter weight options.

2.07 SOFFIT PANELS

- A. Provide "PAC-850" with hook and grab interlock by Peterson Aluminum Corporation, 1-800-441-8661 or approved equal, 1/2" deep x 12" wide, roll-formed from .032 aluminum. Provide one-half vented panels for 20% of the total installation. Refer to Reflected Ceiling Plan. Mix and match: Use solid panels to fill remaining eave space.
- B. Provide panels with male and female side configurations to form a locking assembly when joined to adjacent panels. Provide manufacturer's standard concealed attachment method.
- C. Finish to be Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation. Color to be selected by Architect from manufacturer's standard line.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Seperate dissimilar metals from each other by painting each metal surface in area of contact with a bituminous coating, or by applying adhesive polyethylene underlayment to each metal surface, or by permanent separation as recommended by manufacturer.
- B. Fabricate sheets, seams, strips, cleats, edge treatments, all integral flashing and other components to profiles, patterns and drainage arrangements shown or required. Provide for thermal expansion and contraction of the work. Seal joints as shown and as required for leakproof construction. Shop fabricate materials to greatest extent possible.

- C. Joint Sealant: Where sealant filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature is moderate at time of installation (40 deg. F to 70 deg. F), set joint members for 50% movement either direction. Adjust setting proportionately for installation at temperatures above 70 deg. F.
- D. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks. Provide uniform, neat seams. Unless otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate so as to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

3.02 PROTECTION

- A. Remove any protective film from exposed surfaces of metal panels with care to avoid damage to finish.
- B. Provide final protection in a manner acceptable to installer that will insure metal panels being without damage or deterioration at time of substantial completion.

END OF SECTION 07 42 13

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install metal flashing and sheet metal work specified.
 - 1. Flashing and Counter-flashing
 - 2. Gutter with Leaf Screen Gutter Guard and Downspouts and Splashblocks
 - 3. Drip Edge
 - 4. Trim
 - 5. Thru-Wall Scuppers with Conductor heads
 - 6. Cricket
 - 7. Chase Cover
 - 8. Louvers
 - 9. Other work indicated and required by project

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Job Supervision: Applicator of work in this Section to furnish competent, qualified foreman present and in charge at all times work is performed.
- B. Applicable Standards:
 - 1. ANSI/SPRI/FM 4435/ES-1-11 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems", and NRCA Guidelines for Complying With Building Codes Using ANSI/SPRI ES-1. Provide shop drawings, to include wood blocking, to meet this standard or certified third party test data for gravel stop, fascia profiles and coping. Refer to the drawings for design wind load parameters. Include wind loads for roof area perimeters and corners on submittals.
 - a. **No exposed fasteners.** When the visibility of fasteners on the face of the edge metal is an issue, the use of a cleat will eliminate the need for these fasteners.

2. Refer to the current edition of the "Architectural Sheet Metal Manual" of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). Use as applicable standard for method and quality of work under this Section where not specifically otherwise shown in Contract Documents. Manufacturer to provide trained metal craftsmen to supervise installation.
3. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
4. ANSI/SPRI GT-1 R2022 - Test Standard for External Gutter Systems per Arkansas Code or the 2021 (or current) International Building Code.

1.05 WARRANTY

- A. Provide manufacturer's guarantee for exterior color finish for a period of 20 years against blistering, peeling, cracking, flaking, checking, chipping and excessive color change and chalking. Color change not to exceed 5 NBS units (per ASTM D-2244.64T) and chalking not less than rating of 8 per ASTM D-659.
- B. Guaranty: Guaranty sheet metal work installed under this Section against leakage or defects for 2 years after substantial completion date. Make good at Contractor expense leakage or defects occurring within this period.

PART 2 - PRODUCTS

2.01 SHEET METAL

- A. G-60 Galvalume Steel: Aluminum-zinc alloy coating AZ50, meeting ASTM A792. Keep Galvalume dry during transit, in storage, and at work site.
 1. At locations where flashing is visible from outside building, finish to be Kynar 500® based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's complete line.
 - a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
 - b. Approved equal: Hylar 5000®.
 2. Provide mill finish at locations not visible from outside building or public view.
- B. G-90 Bare Galvanized Steel: Conform to ASTM A525 General Requirements and to ASTM A526, Commercial Quality for hot-dip galvanizing (HDG) process. Zinc coating weight not less than 1-1/4 ounces per square foot nor more than 1-1/2 ounces per square foot of surfaces covered and conforming to ASTM A90, Table X1.1, measurement.
- C. Aluminum Sheet: Provide 3003-0 alloy for flashings. For all other sheet metal work furnish 3003-14 alloy.
 1. Factory finish with oven cured Kynar 500® based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's complete line.

- a. Primer is applied to 0.20 - 0.30 mils DFT (Dry Film Thickness) and the topcoat at 1.0 - 1.2 mils DFT.
 - b. Approved equal: Hylar 5000®.
- D. Soft Temper Sheet Metal: Lead sheet, F.S. QQ-L-201, Grade B, 4 lb. per sq. ft.
- E. Gauge of Metal:
 - 1. Metal components of a roof assembly: 24 gauge (USS .025") minimum
 - 2. Scuppers, guttering, down spouts and splash pans (roof locations): 22 gauge (USS .0312") minimum. Gutter straps to be 18 gage.
 - 3. Through-Wall Flashing: 26 gauge minimum

2.02 GUTTER SYSTEM

- A. Provide accessories for complete installation including end pieces, caps, elbows, outlet tubes, mitres, hangers and basket type strainers. Conform to ANSI/SPRI GT-1 2016 (R2022) - Test Standard for External Gutter Systems per Arkansas Code (2021 IBC).
 - 1. Box Gutter: 6" F-Style 24 Gauge Kynar Colored Galvalume Steel. Provide continuous removable Leaf Screen with sheet metal frame and stainless steel screen by LeafFilter® or approved equal microscreen type.
 - 2. Downspout: 4" Plain Round 24 Gauge Smooth Pre-Finished Kynar Steel with elbows and adapters.
- B. Manufactured from Galvalume sheet steel in minimum 10 foot lengths, tapered and notched to provide a 1" telescoping lap joint. Seal watertight, and secure with 1/8" rivets, or join sections with flat locked soldered seams.
- C. Space gutter hangers and braces not more than 36" apart and secure with screws, bolts or approved clips. Brackets to be of compatible material to gutter, with matching finish and color.
- D. Slope gutter 1" in 20 feet to down spout to avoid ponding.
- E. Make leaders (downspouts) with 1-1/2" telescoped joints or full length without joints. Set leaders plumb, clear of walls. Secure with straps not over 6 feet apart and space so one is near top and another near bottom.
- F. Finish: Kynar 500 based polyvinylidene fluoride (PVDF) coating, 70% resin formulation in color to be selected by Architect from manufacturer's standard line.

2.03 GUTTER GUARD

- A. Provide gutter guard system as supplied by LeafBlaster Pro®, 4031 Aspen Grove Dr, Ste 450, Franklin, TN 37067, (866) 483-8166 or approved equal. Provide 40-Year Warranty.
 - 1. Stainless Steel Micro-Mesh with Z-Bend Technology.
 - 2. Frame-Reinforced Stainless Steel Micro-Mesh.

- B. Provide Rainwater Diverters, Fascia Mount Supports, Rails and other accessories as required for a complete installation. Install per manufacturer's published recommendations.
 - 1. Provide Gutter Guard Brush® and telescoping Extension Pole capable of extending up to 20'.

2.04 ACCESSORIES

- A. Fasteners: All metal counter flashing and parapet cap flashing shall be attached with galvanized or cadmium plated screws with neoprene washers. Nails, screws and rivets used at other locations are to be the appropriate type for the purpose as described in the latest edition of the SMACNA Design Manual.
- B. Butyl Sealant Tape: Creates a strong, continuous barrier that prevents moisture and air infiltration to effectively seal seams, overlaps, fastener holes, and other vulnerable areas. Provide GS# 5 Sealant as manufactured by GS® General Sealants, Inc., (800) 762-1144 or approved equal. Website: <https://generalsealants.com/product/gs-5-sealant/>
- C. Solder for Lead: ASTM B 32, 50% tin and 50% lead used with rosin flux.
- D. Roofing Cement: F.S. SS-C-153, Type I, Class A (summer grade) or Class B (winter grade) as applicable.
- E. Bitumastic Coating: F.S. TT-C-494, MIL-C-18480, or SSPC - Paint 12, cold applied solvent type bitumastic coating for application in dry film thickness of 15 mils per coat.
- F. Splash Blocks: Provide 24" long x 11-1/2" wide x 2-3/4" high High Strength Concrete as manufactured by Nitterhouse Masonry Products, LLC, (717) 268-4137 or approved equal at each Down Spout location or as indicated on the drawings.
 - 1. Plastic or composite splash blocks will not be allowed.

2.05 FABRICATION

- A. Fabricate all metal flashing, counter-flashing, trim and related items to comply with profiles and sizes required. Fabricate to comply with the latest edition of the SMACNA "Architectural Sheet Metal Manual", metal manufacturer's recommendations, and recognized industry practices.
- B. For continuous running work, fabricate with expansion joints in flashing, spaced sufficiently close to prevent flashing damage and failure in resistance to water penetration. Form flashing to fit substrate in each application.
- C. Where sheet metal is required and no material or gauge is indicated on the Drawings, furnish and install highest quality and gauge commensurate with the referenced applicable standard, (SMACNA Manual, latest edition).

2.06 OTHER MATERIALS

- A. Provide materials, not specifically described but required for complete and proper installation of flashing and sheet metal, of new materials, first quality of their respective kinds, and subject to approval of Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Prior to work of this Section, carefully inspect installed work of other trades and verify work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with sheet metal installation in areas of discrepancy until discrepancies are resolved.

3.02 WORKMANSHIP

- A. General: Form sheet metal accurately to dimensions and shapes required, watertight and weather-tight, with angles and broken surfaces true, sharp, and in straight lines. Where intercepting other members, cope to an accurate fit and solder securely. Produce flat surfaces free from waves and buckles.
- B. Expansion: Allow a 3/8"-1/2" gap in coping caps between each section. Use 3-1/2" wide pre-finished 24 gage cover plate over joints.
 - 1. Set cover plates in visible bead of polyurethane sealant between the cap and cover plate. Wipe joints of excessive sealant.
 - 2. Attach cover plate at the front and back with hex head cadmium screws with neoprene washers, installed in the gap between the metal cap sections.
 - 3. Do not exceed maximum length of 10'-0" for cap, fascia and flashing sections. Furnish with factory formed slots or enlarged holes for fasteners.
- C. Paint metal in contact with mortar, concrete, and masonry materials with an alkali-resistant coating. Use heavy-bodied bituminous paint or approved equal.

3.03 THROUGH-WALL FLASHING

- A. General:
 - 1. Install continuous through-wall flashing.
 - 2. Where exposed portions are used as a counter-flashing, lap base flashing at least four inches and use thickness of metal as specified for exposed locations.
 - 3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing.
 - 4. Terminate exterior edge beyond face of wall approximately 1/4-inch with drip edge where not part of counter flashing.

5. Turn back edge up 1/4-inch unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 2 inches into unit unless shown otherwise.
7. Under coping terminate both edges beyond face of wall approximately 1/4-inch with drip edge.
8. Lap end joints not less than four inches. Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
11. Where ends of flashing terminate turn ends up 1 inch and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
12. Turn flashing up not less than 8 inches between masonry wythes or behind exterior veneer.

END OF SECTION 07 60 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Exposed Flexible trim/fascia units.
- B. Concealed Flexible flashing.
- C. Flexible roof/wall expansion joint systems.
- D. Mastic for setting and sealing joints.

1.02 RELATED SECTIONS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 60 00 - Flashing and Sheet Metal.
- D. Section 07 92 00 - Joint Sealants.

1.03 REFERENCES

- A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
- B. ASTM D 1004 - Standard Test Methods for Initial Tear Resistance of Plastic Film and Sheeting.

1.04 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 material, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five year manufacturing experience and capability for design, engineering and technical assistance for the selection, application, and installation of appropriate flashing systems for the project.
- B. Installer Qualifications: Experienced in the proper use and installation of flashing systems, including coordination with flashing of wall assembly components.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Stack flashing materials to avoid twisting, bending and abrasion. Protect materials from weather before installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 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.
- B. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Nervastral Inc., which is located at: P. O. Box 11132 ; Greenwich, CT 06831; Toll Free Tel: 888-622-6030; Email: request info; Web: www.nervastral.com
- B. Substitutions:
 - 1. HydroFlash® UV + Flashing Tape by Benjamin Obdyke for open-joint cladding applications. Install per manufacturer's published recommendations - Typical.
 - 2. York 304 Self Adhering Stainless Steel Flexible Flashing.

3. Flex-Flash Flashing Self Adhering Flashing by Hohmann & Barnard, Inc.
 4. Weathermate™ Flexible Flashing by Dupont™
 5. Air-Shield™ Thru-Wall Flashing by W.R. Meadows.
 6. Blueskin® TWF Self-Adhered Thru-Wall Flashing Membrane by Henry®.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 33 00.
- D. Stainless Steel Drip Plate Flashing: DO NOT USE unless otherwise noted and approved by the design professional.
- E. Open Cavity Installation: All walls to receive thru-wall flashing should be capped to prevent moisture infiltration from entering the wall during construction.

2.02 MATERIALS

- A. Elastic Sheet Flashing Materials: Nervastral elastic sheet flashing membrane, non-reinforced flexible, black elastic sheet flashing complying with the following:
1. Tensile Strength: ASTM D 412, 2000 psi.
 2. Ultimate Elongation: ASTM D 412, 250 percent.
 3. Tear Resistance: ASTM D 1004, 350 lbs. per linear inch.
 4. Flexible over a 1/16 inch mandrel at minus 20 degrees F.
- B. Bituminous Membrane Flashing Materials: Nervastral Bitu-Rap sheet flashing membrane, cross linked polyethylene sheet laminated to a rubber-asphalt membrane, complying with the following:
1. Tensile Strength: ASTM D 412, 21 pounds per inch width.
 2. Ultimate Elongation: ASTM D 412, 350 percent.
 3. Tear Resistance: ASTM D 1004, 350 lbs. per linear inch.
 4. MVT: 0.2g/100 in 2nd/24 hr.
- C. Exposed Flashing:
1. Nervastral 600 Elastic Sheet Flashing: Recommended for exposed flashing in place of metal. 0.0625 inch gauge, width: 12 inches to 48 inches.
- D. Concealed Flashing:
1. Nervastral 56 Elastic Sheet Flashing: Concealed Flashing, 0.056 inch gauge (1.4 mm), width: 12 inches to 48 inches (305 mm to 1219 mm).
 2. Nervastral 300 Elastic Sheet Flashing: Concealed Flashing, 0.030 inch gauge (0.7 mm), width: 8 inches to 60 inches (203 mm to 1829 mm).
 3. Nervastral HD Elastic Sheet Flashing: Concealed Flashing, 0.020 inch gauge (0.5 mm), width: 8 inches to 60 inches (203 mm to 1829 mm).
 4. Nervastral HD-15 Elastic Sheet Flashing: Concealed Flashing. 0.015 inch gauge (0.4 mm), width: 12 inches to 60 inches (305 mm to 1829 mm).
 5. Nervastral Bitu-Rap Bituminous Membrane Flashing: 40 mils (1 mm) thick.

- F. Cold Setting Mastic: Nervastral Nervaplast Adhesive formulated for use with PVC flashing. Tacky, fast-grabbing semi-pressure-sensitive rubber or resin base adhesive suitable for bonding PVC sheet to itself and to a wide variety of building materials.
- G. Roofing Cement: Cut-back asphalt containing long fibered material, in trowel grade consistency.

2.03 FABRICATION

- A. Forming: Fabricate flashings true to shape and accurate in dimension. Form pieces in longest possible lengths to minimize joints. Fold flashing at corners and at ends of pans instead of cutting.
- B. Joints: Provide not less than 4 inches of overlap at flashing joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Surfaces to receive flashing shall be reasonably smooth, free from holes or other irregularities and dry to ensure proper bonding to substrate. Metal surfaces shall be free of scale, oil, grease and dust to assure a proper bond.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide flexible flashing in the locations indicated on the Drawings.
- C. Provide Flexible flashings for concealed flashings at the following locations:
 - 1. Around windows and doors.
 - 2. Water protection on sills and heads of openings.

3. Spandrel beams.
 4. Parapets.
 5. Brick masonry through wall flashings and at cavity walls.
- D. Provide Flexible flashings for exposed flashings at the following locations:
1. Roof parapets
 2. Roof equipment curbs.
 3. Skylights.
 4. Vent pipes.
 5. Perimeter curbs.
 6. Expansion joints.
- E. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
1. Carry flashing through wall and leave exposed for inspection.
 2. After inspection, cut flashing flush with surface of masonry.
 3. Remove mortar or other obstructions from weep holes at flashing locations.
- F. Flashing in Frame Construction: Install over solid backing, both vertically and horizontally. Secure in place with mastic; avoid puncturing installed flashing with nails or other fasteners.
- G. Miscellaneous Flashing: Lay flashing in full trowel coat of mastic, lapping joints not less than 6 inches. Roll surface of flashing with rubber hand roller to remove all air.
- H. Use Nervastral Nervaplast Cold Setting Mastic with all flashing. Roofing cement may be used only at non-critical locations.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged Work before proceeding with construction on concealing work.

END OF SECTION 07 65 00

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PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sloped Roof Ventilation:
 - 1. Ridge vents.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, materials, components, fasteners, finish, and accessories.
- D. Samples: Submit manufacturer's sample of sloped roof ventilation.
 - 1. Sample Length: Minimum 5-1/2 inches.
- E. Color Samples: Submit manufacturer's color samples of sloped roof ventilation, consisting of complete color chart representing manufacturer's full range of available colors.
 - 1. Submit metal chips of specific colors as requested by the Architect.
- F. Manufacturer's Certification: Submit manufacturer's certification that sloped roof ventilation complies with specified requirements and is suitable for intended application.
- G. Warranty Documentation: Submit manufacturer's standard warranty.

1.04 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 07 41 13 - Metal Roof Panels

- B. Section 07 42 13 - Metal Walls Panels.

1.05 PRE-INSTALLATION MEETINGS

- A. Convene preinstallation meeting 2 weeks before start of installation of sloped roof ventilation.
- B. Require attendance of parties directly affecting Work of this Section, including Contractor, Architect, installer, and manufacturer's representative.
- C. Review the Following:
 - 1. Materials.
 - 2. Installation.
 - 3. Adjusting.
 - 4. Cleaning.
 - 5. Protection.
 - 6. Coordination with other Work.

1.06 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer regularly engaged in the manufacturing of sloped roof ventilation of similar type to that specified for a minimum of 10 years.
- B. Installer's Qualifications:
 - 1. Installer regularly engaged in installation of sloped roof ventilation of similar type to that specified for a minimum of 5 years.
 - 2. Use persons trained for installation of sloped roof ventilation of similar type to that specified following manufacturer's installation instructions.
- C. Testing: Meet specified testing requirements.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging.
- B. Storage and Handling Requirements:
 - 1. Store and handle sloped roof ventilation in accordance with manufacturer's instructions.
 - 2. Inspect and report damage or other issues to manufacturer within 72 hours of receipt of materials.
 - 3. Keep sloped roof ventilation in manufacturer's original, unopened containers and packaging until installation.
 - 4. Store sloped roof ventilation in clean, dry area indoors.
 - 5. Do not store sloped roof ventilation directly on floor or ground.
 - 6. Protect sloped roof ventilation and finish during storage, handling, and installation to prevent damage.

1.08 WARRANTY

- A. Warranty Period, Product:
 - 1. Five-year workmanship warranty covering replacement or repair of products that are defective in material or workmanship.
- B. Warranty Period, Finish: Limited 30-year warranty for pre-finished coil-coated steel and aluminum coated with Kynar 500 standard colors covering fade, chalk, and film integrity.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Provide vents fabricated by Cor-A-Vent, Inc.; P.O. Box 428; Mishawaka, IN 46546-0428. ASD. Tel: (800) 837-8368. Fax: (800) 645-6162 or approved equal.

2.02 RIDGE VENTS

- A. Ridge Vents - General: Manufactured of corrosion-free, extruded, high-density polypropylene. Ridge Vents with an "E" in name have enhanced snow screen.
- B. Ridge Vents: Cor-A-Vent V-600 11" - Architectural Metal Roof Application.
 - 1. Net free area: 20 sq in per lin ft.
 - 2. Low Profile Metal Roof Cap Color: Match Metal Roof Panel Kynar Color.
 - 3. Dimensions: 48 inches long by 1 inch high.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that framing, sheathing, and metal roof panels are secured and ready to receive vents.
- B. Verify that there is a 1 inch wide clear air space between sheathing and each side of ridge board or, if trusses are used, a 1-1/2 inches wide continuous clear air space centered on ridge.

3.02 INSTALLATION

- A. General:
 - 1. Install ridge vents along entire length of roof ridges.
- B. Ridge Vents:
 - 1. Fit end cap onto one end of the first and last piece of ridge vent.

2. Lay a bead of calking on the underside of the end cap, press the piece and cap into position, and nail through the end cap, the ridge vent, and into the roof sheathing.
 3. Use roofing nails that are long enough to penetrate ridge vent and through roof sheathing.
 4. Drive the nails down flush so that the vent and end cap are held down firmly.
 5. Do not indent by over driving.
 6. Butt each successive piece up snugly, checking for straight alignment.
 7. Use 2 nails in each end and 1 at each side at center, pulling up slightly when nailing second side to ensure that the vent is nailed at the same pitch as the roof.
 8. If roof shingles are the heavy dimensional type, a bead of sealant must be applied on top of the shingles to provide weather seal between the shingles and vent.
- C. Metal Roofing: Install ridge and soffit vents as specified by manufacturer and in accordance with drawings.
- D. Flashing: Install all specified flashing where indicated on the drawings.

3.03 ADJUST AND CLEAN

- A. Remove any scrap from the site and leave in a neat and clean condition.

END OF SECTION 07 72 30

PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Furnish labor, materials, tools, and equipment required to completely close (with caulking compound or sealant) all joints to give a finished appearance. Items to be caulked or sealed include but are not limited to the following:
1. Hollow metal frames.
 2. Exterior doors, louvers, windows and any other openings in exterior walls.
 3. Interior fixed glass.
 4. Penetrations by piping, conduit and similar items.
 5. Plumbing fixtures.
 6. Millwork.
 7. Flooring, including saw-cut concrete slab-on-grade.
 8. Paving and sidewalk joints.
 9. Dissimilar finishes.
 10. Joints shown on drawings or specified to be caulked or sealed.
 11. All joints or gaps between similar or dissimilar materials that do not receive closure trim are to be caulked/sealed with the appropriate material as listed in Part 2 of this Section.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Installer qualifications.
- D. Contractor certification.
- E. Manufacturer's installation instructions for each product used.
- F. Cured samples of exposed sealants for each color.
- G. Manufacturer's Literature and Data:
1. Primers

2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- H. Manufacturer warranty.

1.04 REFERENCES

- A. ASTM E84 (UL 723): Surface Burning Characteristics
- B. ASTM E814 (UL 1479) and ULC-S115: Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- C. ASTM E1966 (UL 2079): Standard Test Method for Fire-Resistive Joint Systems
- D. ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.05 QUALITY ASSURANCE

- A. Qualifications of Applicators: Use workmen thoroughly skilled and specially trained in techniques of caulking, and completely familiar with manufacturer's published recommendations for caulking material used.
- B. Rejection of Installed Caulking: Lack of skill by caulking installers is sufficient ground for Architect to reject installed caulking and to require its removal and complete recaulking at Contractor's expense.
- C. Guarantee: Guarantee caulking materials and workmanship, in writing for 2 years after substantial completion date. Repair at Contractors expense any defects developing within guarantee period.
- D. Submit manufacturer's product data sheets and color selection information for every brand and type of sealant, caulk and accessory item proposed for use on this project.
- E. Refer to Underwriters Laboratories, Inc. (UL) Volume 2 with Hourly Ratings for Joint Systems, Through-Penetration Firestop Systems and Electrical Circuit Protective Systems and Duct Assemblies.

1.06 PRODUCT HANDLING

- A. Protection: Protect caulking materials before, during, and after installation. Protect installed work and materials of other trades. In event of damage, immediately make repairs and replacements necessary at Contractor's expense.
- B. Storage: Store caulking materials and equipment under conditions recommended by manufacturer. Do not use materials stored for period of time exceeding maximum recommended material shelf-life.

1.07 JOB CONDITIONS

- A. Inspection: Carefully inspect installed work of trades and verify work is complete to point where this installation may properly commence.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.
- C. Do not install sealants under adverse weather conditions, or when temperatures are not within manufacturer's recommended limitations for installation. Install sealants only when forecasted weather conditions are favorable for proper care and development of high early bond strength.

1.08 MOCK-UP

- 1. Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

PART 2 - PRODUCTS

2.01 MATERIALS FOR CAULKING AND SEALING

- A. Select caulking materials for specific locations complying with manufacturer's recommendations. Provide caulking, sealant and accessory items in color(s) selected to match adjacent materials or as selected by Architect from manufacturer's complete line.
- B. Silicone Sealant: Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 25.
 - 1. Silicone Sealant 790/791/795 by Dow-Corning Corp.
 - 2. Spectrum 1 by Tremco
 - 3. 890 FTS/864 NST by Pecora Corporation
 - 4. Approved Equal
- C. Mildew-Resistant Silicone Sealant: Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 25.
 - 1. Silicone Sealant 786 by Dow-Corning Corp.
 - 2. Sanitary 1700 by GE.
 - 3. Approved equal.
- D. Acrylic Latex Caulk (interior only): General purpose, gun grade, non-sag, paintable, non-staining latex sealant complying with ASTM C834.
 - 1. AC-20 + Silicone by Pecora.
 - 2. Acrylic Latex by Tremco.
 - 3. Approved equal.

- E. Acoustical Sealant: General purpose, gun grade, non-sag, paintable, non-staining latex sealant complying with ASTM C834.
1. SHEETROCK® Brand Acoustical Sealant by U.S. Gypsum
 2. AC-20® FTR Acoustical and Insulation Sealant by Pecora Corporation
 3. STOPGAP by Auralex Acoustics
 4. Sashco Big Stretch Caulk
 5. Green Glue Noiseproofing Sealant
 3. Approved equal.
- F. Polyurethane Sealant (for vertical surfaces): Single component, non-sag, gun grade product meeting ASTM C920, Type S, Grade NS, Class 35.
1. MasterSeal® NP 1™ (formerly Sonolastic® NP 1™).
 2. Vulkem 921 by Mameco.
 3. Dynatrol I by Pecora.
 4. Dymonic by Tremco.
 5. QSC-102 by Carlisle.
 6. Approved equal.
- G. Polyurethane Sealant (for horizontal surfaces): Single component, non-priming, self-leveling, pourable grade product meeting ASTM C920, Type S, Grade P, Class 25.
1. MasterSeal® SL 1™ (formerly Sonolastic® SL 1™).
 2. Vulkem 45 by Mameco.
 3. NR-201 by Pecora.
 4. THC-901 by Tremco.
 5. QSC-131 by Carlisle.
 6. Approved equal.
- H. Two component epoxy system (laboratory sink components) to withstand prolonged immersion in gasoline, gasohol, fuels, oils, alcohols, methyl, ethyl, butyl, ethyl acetates, toluene, as well as a wide number of other organic and inorganic solvents. Excellent mechanical properties including high tensile and compressive strengths.
1. MasterBond®, Inc. EP21ARHT; Tel.: (201) 343-8983
 2. Viton® Fluoroelastomer Chemical-Resistant Sealant as provided by Master-Carr
 3. Approved equal

2.02 SEALANT BACKER RODS

- A. Sealant Backer Rod for general use except at floor and deck joints: Tremco Open Cell Polyurethane, or approved equal, open cell type as recommended by sealant manufacturer for compatibility with sealant.
- B. Sealant Backer Rod for use at horizontal floor and deck joints: MasterSeal® 920 by BASF, or approve equal closed cell type as recommended by sealant manufacturer for compatibility with sealant. MasterSeal® 921 by BASF may be used where appropriate.

- C. Provide rod sized and shaped to control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.

2.03 MISCELLANEOUS MATERIALS

- A. Joint Cleaner Compound: Use type recommended by sealant and caulking compound manufacturer for joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Use type recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Use self adhesive polyethylene tape or plastic tape recommended by sealant manufacturer. Apply to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant.
- D. Joint Filler: W.R. Meadows, Sealtight Standard Cork, Expansion Joint Filler produced from clean, selected, granulated cork bonded with a phenolic resin, or approved equal meeting ASTM D 1752, Type II.

2.04 GENERAL APPLICATION GUIDE

- A. Interior caulking, except joints with ceramic tile, metal, glass and aluminum: Acrylic Latex Caulk.
- B. Sound rated walls, partitions and ceilings: Acoustical Sealant.
- C. Interior and Exterior joints with metal, glass and aluminum: Silicone sealant.
- D. Joints with ceramic tile and plumbing fixtures: Mildew resistant Silicone sealant.
- E. Horizontal and Vertical building joints: Polyurethane sealant.

PART 3 - EXECUTION

3.01 CHOICE OF CAULKING MATERIAL

- A. Use sealant and caulking materials best suited to the installation and recommended by caulking material manufacturer.

3.02 INSPECTION

- A. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed. Do not proceed with joint sealer work until unsatisfactory conditions are corrected.

3.03 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of gaskets, sealants and caulking compounds. Remove dirt, insecure coatings, moisture and substrates which could interfere with gasket seal and bond of sealant or caulking compound. Etch concrete and masonry joint surfaces when recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where required, and when recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond. Do not allow spillage and migration onto adjoining surfaces.

3.04 INSTALLATION

- A. Comply with manufacturer's printed instructions except when more stringent requirements are specified, and except when manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth and position in joint as required to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod except when required to be omitted or recommended to be omitted by sealant manufacturer for application required.
- D. Install bond breaker tape when required by manufacturer's recommendations to ensure liquid-applied sealants will perform as intended.
- E. Employ proven installation techniques, which ensure sealants are deposited in uniform, continuous ribbon without gaps or air pockets, and with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise required, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints occur between a horizontal surface and vertical surface, fill joint to form a slight cove, so joint will not trap moisture and dirt.
- F. Install liquid-applied sealant to depths required and as recommended by sealant manufacturer.
- G. Spillage: Do not allow sealants and compounds to overflow from joint confines or to spill onto adjoining work, or to migrate into voids of exposed finished. Clean adjoining surfaces to eliminate evidence of spillage without damaging adjoining surfaces.
- H. Recess edges of exposed joint fillers slightly behind adjoining surfaces, unless otherwise required, so compressed units will not protrude from joints.

- I. Acoustical Sealant Application: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
 - 1. Where sound rated walls and partitions are penetrated by pipe, conduit, duct, etc.; pack annular space with acoustical fiberglass insulation until flush with both faces of wall. Seal both sides and the entire annular space between the penetrating item and the wall board with acoustical sealant. Also, seal at top and bottom edges of acoustical walls and partitions where wall board abuts a horizontal surface. Joint is to be full and continuous from slab to gypsum board edge at bottom of gypsum board walls.
 - 2. Do not allow any rigid material or connection to bridge the separation between the acoustical construction and the penetrating item. Upon inspection, if bridging is found to exist, all sealed penetrations may be ordered removed and resealed at Contractor's expense.
- J. At joints in face brick and precast concrete, apply sand and ground up mortar to uncured sealant to match appearance of mortar joints.

3.05 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Cure and protect sealants in manner which will minimize increases in modules of elasticity and accelerated aging effects.

END OF SECTION 07 92 00

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 references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical and access control door hardware.
 - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 - 4. Automatic operators.
 - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Door Hardware".
- D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives.

The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should

be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handling and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:
1. MK - McKinney
 2. PE - Pemko
 3. RO - Rockwood
 4. YA - ASSA ABLOY ACCENTRA
 5. HS - HES
 6. RS - RITE Slide
 7. RF - Rixson
 8. NO - Norton Rixson
 9. HD - HID
 10. SU - Securitron

Hardware Sets

Set: 5.0

Doors: 103B

Description: INTERIOR PAIR - PUSH/PULL x CLOSER

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
2 Push Plate	70C-RKW	US32D RO 087100
2 Pull	RM301 Mtg-Type 6HD	US32D RO 087100
2 Closer x Stop	CLP7500	689 NO 087100

Set: 6.0

Doors: 104A, 114A, 127A

Description: INTERIOR PAIR STOREROOM LOCK x MFB x CLOSER w/STOP ARM x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
2 Flush Bolt	555	US26D RO 087100
1 Storeroom or Closet Lock	PB 4705LN	626 YA 087100
2 Surface Closer	PR7500H	689 NO 087100
2 Electromagnetic Holder	996M	689 NO 087100 ⚡
2 Silencer	608-RKW	RO 087100

Set: 7.0

Doors: 126A

Description: INTERIOR PAIR STOREROOM LOCK x MFB x CLOSER w/STOP ARM x GASKETING

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
2 Flush Bolt	555	US26D RO 087100
1 Storeroom or Closet Lock	PB 4705LN	626 YA 087100
2 Surface Closer	PR7500H	689 NO 087100
2 Electromagnetic Holder	996M	689 NO 087100 ⚡
1 Gasketing	S88BL 25'	PE 087100

Set: 8.0

Doors: 108A

Description: SINGLE STOREROOM LOCK x CLOSER x WALL STOP x GASKETING

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Storeroom or Closet Lock	PB 4705LN	626 YA 087100
1 Closer	PR7500 / Reg 7500 (as req'd)	689 NO 087100
1 Stop	406 / 409 / 441	US26D RO 087100
1 Perimeter Gasketing	S88BL (head & jambs)	PE 087100

Set: 9.0

Doors: 115A

Description: SINGLE STOREROOM LOCK x CLOSER W/STOP ARM x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100

1 Storeroom or Closet Lock	PB 4705LN	626	YA 087100
1 Closer x Stop	CLP7500	689	NO 087100
3 Silencer	608-RKW		RO 087100

Set: 10.0

Doors: 112A, 118A, 120A, 121A, 123A

Description: PASSAGE SET x WALL OR FLOOR STOP x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Passage Latch	PB 4701LN	626 YA 087100
1 Stop	406 / 409 / 441	US26D RO 087100
3 Silencer	608-RKW	RO 087100

Set: 11.0

Doors: 113A

Description: OFFICE LOCK x CLOSER W/STOP ARM x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Entry Lock	PB 4704LN	626 YA 087100
1 Closer x Stop	CLP7500	689 NO 087100
1 Silencer	608-RKW	RO 087100

Set: 12.0

Doors: 110A

Description: STOREROOM LOCK x OH STOP x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Storeroom or Closet Lock	PB 4705LN	626 YA 087100
1 Surface Overhead Holder/Stop	10-336	689 NO 087100
3 Silencer	608-RKW	RO 087100

Set: 13.0

Doors: 109A, 111A, 116A, 117A, 119A, 124A, 125A

Description: OFFICE LOCK x WALL STOP x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Entry Lock	PB 4704LN	626 YA 087100
1 Stop	406 / 409 / 441	US26D RO 087100
3 Silencer	608-RKW	RO 087100

Set: 14.0

Doors: 105A

Description: PUSH/PULL x CLOSER W/HO x SILENCERS

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Push Plate	70C-RKW	US32D RO 087100
1 Pull	RM301 Mtg-Type 6HD	US32D RO 087100
1 Closer x HO	PR7500H / 7500H (as req'd)	689 NO 087100
3 Silencer	608-RKW	RO 087100

Set: 15.0

Doors: 106A, 107A

Description: PRIVACY W/INDICATOR x WALL STOP x GASKETING

4 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Privacy	PB YPL02	626 YA 087100
1 Perimeter Gasketing	S88BL (head & jambs)	PE 087100

Set: 16.0

Doors: 102A

Description: SINGLE INTERIOR x FAIL SECURE LOCK x CARD READER x CLOSER W/STOP ARM x SILENCERS

1 Hinge, Full Mortise	TA2714-MCK QC4 4-1/2" x 4-1/2"	US26D MK 087100 ⚡
3 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Fail Secure Lock	PB 4791LN	626 YA 087100 ⚡
1 Closer x Stop	CLP7500	689 NO 087100
3 Silencer	608-RKW	RO 087100
1 Card Reader	By Security Contractor	BLK HD

Set: 17.0

Doors: 122A

Description: SINGLE INTERIOR x FAIL SECURE LOCK x CARD READER x CLOSER x WALL STOP x SILENCERS

1 Hinge, Full Mortise	TA2714-MCK QC4 4-1/2" x 4-1/2"	US26D MK 087100 ⚡
3 Hinge, Full Mortise	TA2714-MCK 4-1/2" x 4-1/2"	US26D MK 087100
1 Fail Secure Lock	PB 4791LN	626 YA 087100 ⚡

1 Closer	PR7500 / Reg 7500 (as req'd)	689	NO 087100
3 Silencer	608-RKW		RO 087100
1 Card Reader	By Security Contractor	BLK	HD

Set: 18.0

Doors: 100A

Description: SINGLE EXTERIOR x FAIL SECURE LOCK x CARD READER

3 Hinge	TA2314 (NRP)	US32D	MK 087100	
1 Hinge, Full Mortise	TA2314 QC4 4-1/2" x 4-1/2"	US32D	MK 087100	⚡
1 Fail Secure Lock	PB 4791LN	626	YA 087100	⚡
1 Closer	PR7500 / Reg 7500 (as req'd)	689	NO 087100	
1 Perimeter Gasketing	S88BL (head & jambs)		PE 087100	
1 Rain Guard	346C (frame width)		PE 087100	
1 Brush Sweep	18061CNB		PE 087100	
1 Threshold - 5" T-Break	252x3AFG		PE 087100	
1 E-Lynx Harness (Frame)	QC-C3000P		MK 087100	⚡
1 ElectroLynx Harness	QC-C003		MK 087100	⚡
1 Card Reader	By Security Contractor	BLK	HD	

Set: 19.0

Doors: 103A, 113J

Description: EXTERIOR PAIR x ELEC PANIC x CARD READER

3 Hinge	TA2314 (NRP)	US32D	MK 087100	
1 Hinge, Full Mortise	TA2314 QC12 4-1/2" x 4-1/2"	US32D	MK 087100	⚡
1 Mullion	KRM200SM 8'	600	YA 087100	
1 Rim Exit Device, Fail Secure	6200 PB691F	630	YA 087100	
1 Rim Exit Device, Exit Only	6200 EO	630	YA 087100	
2 Closer	PR7500 / Reg 7500 (as req'd)	689	NO 087100	
1 Perimeter Gasketing	S88BL (head & jambs)		PE 087100	
1 Rain Guard	346C (frame width)		PE 087100	
1 Brush Sweep	18061CNB		PE 087100	
1 Threshold - 5" T-Break	252x3AFG		PE 087100	
1 E-Lynx Harness (Frame)	QC-C3000P		MK 087100	⚡
1 ElectroLynx Harness	QC-C003		MK 087100	⚡
1 Card Reader	By Security Contractor	BLK	HD	

Set: 20.0

Doors: 113B, 113C

Description: OVERHEAD DOOR - KEYED CYLINDER ONLY

Notes: Cylinder and core only to match facility standard. All other hardware by door manufacturer.

END OF SECTION 08 06 71

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide hollow metal doors, door frames and window frames required.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. ANSI A224.1 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
- C. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcements.
- D. ANSI/ISDI-104 -Water Penetration Performance Standard for Insulated Steel Door Systems.
- E. ANSI/ISDSI-103 - Acoustical Performance Standard for Insulated Steel Door Systems.
- F. ANSI/ISDSI-105 - Mechanical Performance Standard for Insulated Steel Door Systems.
- G. ANSI/SDI 100 - Recommended Specifications for Standard Steel Doors & Frames; Steel Door Institute.
- H. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- I. ASTM B 117 - Standard Method of Salt Spray (Fog) Testing.
- J. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
- K. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
- L. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- M. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.
- N. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- O. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure.
- P. NFPA 80 - Standard for Fire Doors and Windows.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- R. SDI 105 - Recommended Erection Instructions for Steel Frames
- S. SDI 111 - Recommended Standard Details - Steel Doors and Frames.
- T. SDI 113 - Test Procedure and Acceptance Criteria for Apparent Thermal Performance for Steel Door and Frame Assemblies.
- U. SDI 114 - Test Procedure and Acceptance Criteria for Acoustical Performance for Steel Door and Frame Assemblies.
- V. SDI 116 - Test Procedure and Acceptance Criteria for Rate of Air Flow Through Closed Steel Door and Frame Assemblies.
- W. Warnock Hersey International Inc. (WHI) - Certification Listings.
- X. Uniform Building Code (UBC).
- Y. UL 10B - Standard for Fire Tests of Door Assemblies.
- Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Underwriters Laboratory Inc.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member of Steel Door Institute (SDI) or Hollow Metal Manufacturers Association (HMMA).
- B. Use skilled workmen thoroughly trained and experienced and completely familiar with specified requirements and methods needed for proper performance of work of this Section.
- C. Codes and Standards:
 - 1. Manufacture labeled units in strict accordance with specifications and procedures of Underwriters Laboratories, Inc. Labels must be affixed to rated assemblies.
 - 2. In guarantee and Shop Drawings, apply and use definitions and nomenclature established in American National Standards Institute publication A 123.1 "Nomenclature for Steel Doors and Steel Door Frames."
 - 3. ANSI/SDI A250.8-2017 - Specifications for Standard Steel Doors and Frames.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protection:
 - 1. Deliver, store, and handle hollow metal units to prevent damage and deterioration.
 - 2. Provide packaging of cardboard or containers, separators, banding, spreaders, and paper wrapping to completely protect hollow metal units during transportation and storage.
 - 3. Store units upright, in protected dry area, at least one inch off ground and with at least 1/4" air space between individual pieces. Protect primed and hardware surfaces.
 - 4. Protect installed work and materials of other trades.
 - 5. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spacing between stacked units to promote air circulation.
- B. Replacements: Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work, otherwise, remove and replace damaged items as directed at Contractor's expense.

1.07 WARRANTY

- A. Provide Manufacturer's standard warranty, effective on date of purchase, against defects in product workmanship and materials; minimum 12 months for doors and frames.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Fabricate hollow metal items rigid, neat in appearance, and free from defects, warp, or buckle.

- B. Provide clean cut, straight and true molded members with well-formed and aligned miters.
- C. Dress exposed weld joints smoothly for a seamless appearance at frames and doors. Provide interlocking visible edge seams at door panel corners, not at middle of door edge.
- D. Door Clearances: Maximum 1/8" at jambs and heads, 1/8" at meeting edges of pairs of doors, and 3/4" at bottom from finished floor line.
- E. **Close top and bottom edges of exterior doors flush. Seal against water penetration with flush steel channel fillers.**

2.02 ACCEPTABLE MANUFACTURERS

- A. Provide hollow metal units by the following or other approved equal manufacturers:
 - 1. **National Custom Hollow Metal, 800-334-3070, 1701 E 22nd St, Little Rock, AR, 72206.** Exterior doors and frames; (Interior doors and frames optional).
 - 2. Amweld
 - 3. Ceco Door Products
 - 4. Curries Company
 - 5. Mesker Door
 - 6. Pioneer
 - 7. Republic
 - 8. Commercial Door Solutions and Supply, LLC, 8000 Assembly Court, Suite 30, Little Rock, AR 72209, (501) 257-0054.

2.03 FACTORY PREPARATION

- A. Prepare units to receive hardware scheduled in "Hardware" Section of these specifications and in accordance with ANSI/DHI A 115.
- B. Cut, mortise, reinforce, drill, and tap units at factory, except drill and tap for surface applied hardware at work when hardware is applied.
- C. Prepare door frames for rubber silencers to be provided with frames.

2.04 SHOP PRIME COAT FOR FIELD FINISHED DOORS AND FRAMES

- A. Clean, treat, and prime exposed surfaces of hollow metal units, including galvanized surfaces. All exterior doors and frames shall be galvanized.
- B. Clean steel surfaces free of mill scale, rust, oil, grease, dirt, and foreign materials before applying paint.
- C. Apply shop coat of rust-inhibiting prime paint of even consistency to provide uniformly finished surface ready to receive finish paint.

2.05 FULL FLUSH TYPE DOORS

- A. Construct exterior/interior doors to the designs and gages specified:
1. **Exterior Doors:** Hot dipped galvanized steel, ASTM A653, ZF180, Class A60 coating, 16-gauge Extra Heavy Duty (except where heavier gauge required), with closed tops.
 - a. Include galvanized components and internal reinforcements.
 - b. Core: Rigid Pre-Formed Closed Cell Polyisocyanurate (polyurethane) Board. 2 lb. PCF Density Average to conform to ASTM D2856.
Core U- Factor = 0.100, R-Value = 10.0. STC Rating 28-30.
 2. **Interior Doors:** Hot Dipped galvanized steel, ASTM A 653, ZF120, Class A40 coating, 18-gauge Heavy Duty (except where heavier gauge required), with no exposed face seams.
- B. **Core material at Interior Doors:** To be either water-resistant honeycomb insulation core glued in place, rigid insulation core glued in place or rigid insulation core foamed in place. **Core material at exterior doors to be rigid insulation core foamed in place.**
1. Honeycomb Insulation Core (Glued, Interior Only): Crushing strength of not less than 4,000 psf, and with lamination withstanding not less than 1,500 psf surface shear.
- C. **Core material at Exterior Doors:** Shall be Polyurethane (ISO) insulation, R-Value 1.97, placed in the hollow core of the door. Verify testing if applicable as a fire rated door.
1. Therma Hold, 800-334-3070 for door and frame. Lab Tested NCHM Thermal Rating Level Per ASTM C1363-19. Insulate Thermal Brake Frame Cavity with Mineral Wool. Caulk Frame Edge to adjacent wall. Apply Gasketing Door to Frame preventing air flow. Include Thermal Break Threshold and Sweep (NGP).
- D. Provide doors complete with glazed panels as required. Glass is specified in Section 08 80 00.

2.06 WELDED DOOR FRAMES

- A. Construct exterior/interior welded door frames to the designs and gauges specified:
1. **Exterior Door Frames:** Hot dipped galvanized steel, ASTM A 653, ZF180, Class A60 coating, 16-gauge Extra Heavy Duty (except where heavier gauge required), with closed tops.
 - a. Include galvanized components and internal reinforcements.
 - b. **Overhead Rain Drip Guard:** Provide Anodized or Dark Bronze Aluminum Drip Strip 1.5" high x 2.5" wide x required length(s) by NGP or approved equal, including stainless steel furnished fasteners. Coordinate with Door Hardware Schedule in Section 08 71 00 - Door Hardware. Rain Drip not required where exterior cover is provided.

- c. **Therma Hold Exterior Thermal Break Frames:** Two-part frame applied to Thermal Gasketing and secured every 12" with #8 sheet metal screw. This method separates both sides of the frame jamb and header along the stop to create a barrier preventing temperature transfer from outside to inside.
 - 1) Insulate Thermal Brake Frame Cavity with Mineral Wool.
 - 2) Use Polyurethane (ISO) Core A60 Galvanneal.
 - 3) Caulk Frame Edge to adjacent wall.
 - 4) Apply Gasketing Door to Frame.
 - 5) Include Thermal Break Threshold and Sweep
- 2. **Interior Door Frames:** Hot Dipped galvanized steel, ASTM A 653, ZF120, Class A40 coating, 18-gauge Heavy Duty (except where heavier gauge required), with no exposed face seams.
 - B. Secure headers and jambs at corners by external welding of faces. Grind smooth to provide invisible joints.
 - C. Provide frames with minimum of 3 anchors per jamb for adjoining wall construction and floor anchors for attachment to the floor. Construct anchors using minimum 18-gauge steel.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine areas and conditions for work of this Section. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install hollow metal units in strict accordance with approved Shop Drawings and manufacturer's recommendations.
- B. Set frames accurately, plumbed, aligned, and securely anchored.
- C. Install finish hardware in strict accordance with manufacturers' recommendations. Eliminate hinge-bound conditions, making items operate smoothly with secure locking and latching.

3.03 ADJUST AND CLEAN

- A. Immediately after installation, sand smooth rusted and damaged prime coat. Apply compatible touch-up air-drying primer.

- B. Check and adjust operating finish hardware items, leaving hollow metal units undamaged and in proper operating condition.
- C. Excessive filing or grinding of strike plate will not be accepted. Filing and grinding not to exceed 1/8" in any direction.

END OF SECTION 08 11 13

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PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Provide wood doors, complete. Refer to Door Schedule for types and sizes.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Markings: Furnish door with stamp, brand, or identifying mark indicating door quality and construction. Identifying mark or separate certification to include inspection organization name, identification of standard for door construction, and identity of plant to which stamp was issued.
- B. Identifying Label: Each door shall bear identifying label indicating:
 - 1. Door manufacturer.
 - 2. Order number.
 - 3. Door number.
 - 4. Fire rating, if applicable.
- C. Tolerances for Warp, Telegraphing, Squareness, and Pre-fitting Dimensions: WDMA I.S.1-A.

1.05 REFERENCE STANDARDS

- A. American Society for Testing and Materials: (ASTM) E 152, "Fire Tests of Door Assemblies".
- B. Architectural Woodwork Institute (AWI) Quality Standards: Specifications and Quality Certification Program, Section 1300, "Architectural Flush Doors".

- C. U.S. Dept. of Commerce Commercial Standards: CS 236, "Mat-formed Wood Particle Board".

1.06 WARRANTY

- A. Warranty: Submit written agreement using door manufacturer's standard form, signed by manufacturer, contractor, and installer, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show photographing of construction below in face veneers, or do not conform to NWMA and AWI tolerance limitations. Warranty period is for lifetime of installation.
- B. Limitation and Exclusions:
 - 1. Defects are not natural variations in color or texture of wood. Improper finishing is considered a defect.
 - 2. Warp not considered a defect unless it exceeds 1/4-inch in the plane of the door itself. Warp is distortion in the door itself and does not refer to relationship of door to frame. Term "warp" includes bow, cup and twist. Amount of warp in door is measured by placing a straight-edge on the suspected concave face of door at any angle (horizontally, vertically, diagonally), with door in installed position. Measurement of bow, cup, and twist is made at point of maximum distance between bottom of straight-edge and face of door.

1.07 PRODUCT HANDLING

- A. Protect wood doors during transit, storage and installation to prevent damage, soiling and deterioration. Comply with the "On-Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.
- B. Protection: Store doors in fully covered, well ventilated area. Protect from extreme changes in temperature and humidity.
- C. Replace damaged doors at Contractor's expense.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Provide doors manufactured by one of the following:
 - 1. Algoma
 - 2. Eggers
 - 3. Graham
 - 4. Marshfield
 - 5. Mohawk
 - 6. Oshkosh
 - 7. VT Industries (**Basis-of-Design**)

2.02 GENERAL

- A. Provide wood doors complying with applicable referenced standards for specified door kinds and door types.
 - 1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
 - 2. Adhesive: Type II.
 - 3. Core: Structural composite lumber, except when mineral core is required for fire rating.

2.03 ACCESSORY COMPONENTS

- A. Provide metal edges at all concealed vertical rod devices and at fire rated doors. Provide matching hardwood edges at all non-rated doors.
- B. Provide solid wood glazing beads to match door facing at vision panels in non-rated doors and in sound rated doors. Provide metal glazing beads at rated doors with vision panels. Finish on metal glazing bead to match finish on hollow metal door frame.
- C. Astragals: All pairs of doors on which the active leaf has latching hardware shall be provided with overlapping astragals. Exceptions are pairs of doors equipped with vertical rod exit devices and where open back strikes are provided.
 - 1. Exterior openings are to have astragals applied in such a manner as to cover the gap at the meeting stiles at the exterior side.
 - 2. Doors are to be sized to allow a 1/8" clearance between the meeting edges when an astragal is a part of the assembly as well as when there is no astragal required.
 - 3. The door supplier shall coordinate the need for astragals based upon the hardware specified and the label requirements of the door manufacturer. Shop drawings shall clearly indicate the type of astragals and where they are to be provided.
 - 4. The astragals can be either shop or field applied. Field applied astragals are to be shipped with necessary mounting fasteners.

2.04 SOLID CORE, ARCHITECTURAL FLUSH DOORS

- A. All Solid Core and Architectural Flush Doors are to be manufactured in strict accordance with AWI Section 1300. Furnish, 5-Ply doors with AWI 1300-T-6 Type #5 Edge and with core fully bonded to stiles and rails with Type I Adhesive.
- B. Particle Core Doors: AWI Type PC-5ME particle core doors meeting or exceeding requirements of AWI Section 1300 with ANSI A208.1, Grade 1-LD-2 particleboard core.
- C. Face Veneers:
 - 1. Painted Finish: Provide "A" Grade per AWI 1300, minimum 1/50" thick face veneers using Premium Quality, Medium Density Overlay.
 - 2. Stained Finish: Provide "A" Grade per AWI 1300, minimum 1/50" thick face veneers using Premium Quality. Matched (pairs of doors to be Pair Matched), Slip-Running.

- a. Veneer Cut:
 - 1) Plain Sliced Red Oak
 - b. Finish stain to be custom color selected by Architect.
- H. All doors occurring in a smoke partition are to have an approved, rated vision panel of not less than 100 square inches.

PART 3 - EXECUTION

3.01 FABRICATION

- A. Fabricate wood doors complying with Contract Drawings, with this Section and with the referenced standards for types specified.
- B. Prefit doors at factory with following clearances:
 - 1. 1/8" on top and hinge side
 - 2. 1/8" on lock edge of single doors
 - 3. 1/16" per leaf on pair meeting edges
 - 4. 1/2" from finished floor
 - 5. 3/4" max. from combustible floor
 - 6. 3/8" max. from non-combustible sill or threshold
 - 7. Bevel both edges of door (1/8" in 2"). Specific clearances to be shown on door schedule. Field trimming of fire doors will not be allowed.
 - 8. Seal and refinish edges that are field cut to match factory finish.
- C. Pre-machine doors for hardware as required by Hardware Schedule in Bid Documents and in accordance with requirements of AWI Section 1300. Hardware Schedule by hardware supplier to be furnished complete with templates for all hardware requiring door preparation. Hollow metal frame schedule to be furnished and to include exact location and size of hardware preparation. No door machining to be required for any totally surface-mounted hardware.

3.02 FACTORY FINISH

- A. Factory finish doors in accordance with requirements of AWI Section 1500 for Custom finish.
 - 1. Finish System: AWI Section 1500, Conversion Varnish with custom stain color to be selected by architect.
 - a. Close Grain Woods:
 - Washcoat
 - Custom Stain
 - Sealer
 - Sand
 - Top Coat
 - Top Coat

- b. Open Grain Woods:
Custom Stain
Sealer
Sand
Top Coat
Top Coat
- 2. Apply factory finish to both faces and all edges including top and bottom of all doors.

3.03 INSPECTION

- A. Examine door frames and verify frames are correct type and have been installed for proper hanging of corresponding doors.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Architect.
- C. Install doors only after completion of other work which would raise moisture content of doors or damage surface of doors.

3.04 INSTALLATION

- A. Fit, hang, and trim doors by openings.
- B. Seal cuts made on job immediately after cutting, using clear water-resistant varnish or sealer.
- C. Excessive filing or grinding of strike plate will not be accepted. Filing and grinding not to exceed 1/8" in any direction.

END OF SECTION 08 14 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide doors specified including hardware, operating devices, and accessories for complete installation.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 GUARANTEE

- A. Warranty provisions for Work under this Contract are specified in General Conditions. Supplementary to General Conditions, furnish written guarantee stating work is guaranteed to serve intended purpose under normal use and that defects in materials and workmanship within 1-year period after Contract substantial completion date will be repaired, replaced or made good at Contractor's expense.
- B.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Provide doors manufactured by Overhead Door Corp., Dallas, Texas, 1-800-929-3667 or approved equal.
 - 1. Clopay Commercial Door Products, 800-225-6729.
 - 2. Raynor Worldwide, 888-598-4790.
 - 3. Wayne-Dalton, 855-493-3667.

2.02 INSULATED STEEL SECTIONAL DOORS

- A. Provide "Thermacore" Model 591 doors.
- B. Construct doors of steel/foam/steel sandwich panel with EPDM thermal break and ship lap design with rounded water channels and as follows:
 - 1. Panel Thickness: 1-5/8"
 - 2. Exterior Surface Profile: Microgroove.
 - 3. Exterior Steel: 0.015", hot dipped galvanized.
 - 4. End Stiles: 16 gauge.
 - 5. Standard Springs: 10,000 cycles
 - 6. Insulation: CFC free and HCFC free polyurethane, fully encapsulated.
 - 7. Thermal Values: "R" value of 14.86; U-factor of 0.13.
 - 8. Air Infiltration: 0.08 cfm at 15 mph; 0.13 cfm at 25 mph.
 - 9. Pass Door: Not required.
 - 10. High Usage Package: Not Required.
 - 11. Glazing: Not Required.
- C. Finish: Trinar® Kynar color to be selected by Architect from complete line.
- D. Windload Design: ANSI/NAGDM 102 standards and as required by code.
- E. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
- F. Lock Mechanism: Interior mounted slide bar for use with Owner furnished padlock.
- G. Weatherstripping: EPDM rubber tube seals fitted inside joints between sections. EPDM rubber bulb-type strip at bottom.
- H. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
- I. Manual Operation: Manual Pull Rope.
- J. Electric Operation: Provide UL listed electric operator, type and size recommended by manufacturer to move door in either direction at not less than 8" nor more than 12" per second.
 - 1. Entrapment Protection: Electric Sensing Edge with concealed wire reel. Exposed coiled wire is unacceptable.
 - 2. Operation Controls: Push Button operated control stations with open, close and stop buttons for surface mounting at interior location.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine substrates and conditions under which overhead rolling doors are to be installed. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install door and operating equipment, complete with necessary hardware, jamb and head mold strip, anchors, inserts, hangers, and equipment supports complying with final Shop Drawings, and manufacturer's installation instructions.
- B. Lubricate, test, and adjust doors to provide easy operation, proper closing, and secure locking.
- C. Instruct Owner in operation and maintenance of doors.
- D. Touch up scuffs and abrasions in finish paint.

END OF SECTION 08 36 13

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PART 1 - GENERAL

1.01 SCOPE

- A. Provide aluminum doors, framing and hardware specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Fabricate exterior door and frame units to withstand the wind pressure loading shown or, or if not shown, 20 lbs. per sq. ft. on the gross area of the frames, doors, panels and glass, acting inward and also outward.

1.05 WARRANTY

- A. Submit a warranty signed by the manufacturer, contractor, installer, agreeing to replace aluminum doors, windows, framing and glazing which fail in materials and workmanship within 2 years of the date of acceptance. Failure of materials or workmanship shall include, but not be limited to, failure in operation of doors, windows, and hardware, excessive leakage of air infiltration, excessive deflections, delamination of panels, deterioration of finish or metal in excess of normal weathering, and defect in accessories, weatherstripping, and other components of the work.
 - 1. Submit Extended 5-year warranty on anodized finish.

1.06 ADJUSTMENT

- A. After installation, make adjustments as necessary to insure proper operation of all hardware items.

- B. Door Opening Force: In accordance with the Americans With Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:
1. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.
 2. Exterior hinged doors: 8.5 lbf
 3. Interior hinged doors: 5.0 lbf
 4. These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.
- C. Door Closer: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position of 70°, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers who produce products that may be submitted to Architect for review are:
1. Kawneer (Basis-of-Design)
 2. Oldcastle Building Envelope (OBE)
 3. Tubelite
 4. YKK AP America Inc.
 5. EFCO
 6. Approved equal

2.02 SWINGING GLASS DOORS

- A. Kawneer Model 350, or approved equal, medium width stile, single acting, sizes as indicated, complete with all hardware, except cylinders.

Material Standard: ASTM B 221; 6063-T6 alloy and temper.

1. The door stile and rail face dimensions of the 350 entrance door will be as follows:

Door	Vertical Stile	Top Rail	Cross Rail	Bottom Rail
350	3-1/2"	3-1/2"	NA	10" (to meet ADA)

2. Major portions of the door members to be 0.125" nominal in thickness and glazing molding to be 0.05" thick.
- B. Door corner construction shall consist of mechanical clip fastening, SIGMA 1-1/8" long fillet welds along top and bottom of rail extrusion at stile and rail intersection, and deep penetration plug weld at all four corners of door. MUST BE FULL PENETRATION PLUG WELD TO LEG OF CLIP, 1-1/8" LONG FILLET WELDS ALONG TOP AND

BOTTOM OR RAILS AT STILES INTERSECTION, NO TIE-ROD CONSTRUCTION OF ANY TYPE OR PARTIAL DESIGN ALLOWED. Meeting rail to still joint fillet weld "only" is NOT ACCEPTABLE. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable chord.

- C. Door Corner Warranty Period: Limited Warranty shall begin in no event later than six months from date of shipment. In addition, welded door corner construction shall be supported with a LIMITED LIFETIME WARRANTY for the life of the door under normal use.
- D. Finish:
 - 1. Color Anodic Coating, Class 1: AAM10C22A44 Dark Bronze coating electrolytically deposited complying with AAMA 606.1, 0.7 mil thick minimum.

2.03 ALUMINUM FINISHES

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 - 1. Kawneer Permanodic® AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating (Color: Dark Bronze)

2.04 HARDWARE

- A. Provide hardware by Kawneer Co. or approved equal products from aluminum door and frame manufacturer's standard selections, subject to Architect's review.
 - 1. Push Bars: Kawneer Architect's Classic, Style CP-II Stainless Steel. Omit push bar at panic devices. **HARDWARE SUPPLIER MAY PROVIDE EQUAL ITEM.**
 - 2. Pulls: Kawneer Architect's Classic, Style CO-12 Stainless Steel with Heavy Duty 5/16" Stainless Steel through bolts. **HARDWARE SUPPLIER MAY PROVIDE EQUAL ITEM.**
 - 3. Threshold: Refer to Hardware Schedule.
 - 4. Pivots: Manufacturer's standard, top and bottom offset pivots. Provide intermediate pivots if required due to door size/weight.
 - a. **Do not provide continuous hinges. If provided, match adjacent finish.**
 - 5. Closers: Refer to Hardware Schedule.
 - 6. Locks: Refer to Hardware Schedule.
 - 7. Panic Devices: Refer to Hardware Schedule.
 - 8. Integrated Security Components: Refer to Hardware Schedule.
 - 9. Door Bottoms: Refer to Hardware Schedule.
 - 10. Cylinders: Refer to Hardware Schedule.
 - 11. Removable Mullions: Refer to Hardware Schedule.
- B. All exit devices, door closers, mullions, continuous hinges and cylinders will be furnished under Section 08 71 00 - Finish Hardware, and furnished to the aluminum door supplier for installation either at the factory or on site.

- C. Recommendation: Door frames should have fixed or surface-applied door stops to avoid any issues with installing electric strikes and door closers in lieu of snap-in type door stops.

2.05 FRAMING

- A. Door, Storefront, and Windows: Provide standard shapes and moldings of Kawneer Trifab® VersaGlaze® 451 and 451T glazed framing system or approved equal.
 - 1. Front Set
 - 2. Provide SSG Vertical mullions and accessories where noted on the drawings.
- B. Finish:
 - 1. Color Anodic Coating, Class 1: AAM10C22A44 (Dark Bronze) coating electrolytically deposited complying with AAMA 606.1, 0.7 mil thick minimum.
- C. Aluminum Sheet Breakmetal: Provide 3003-0 alloy.

2.06 ALUMINUM SUB-SILL FLASHING

- A. Aluminum window and framing supplier is to provide aluminum sub-sill flashing "pans" of same aluminum alloy as frames and of minimum .050" thickness. Form pans by turning up ends and interior side 1-1/2". Lap end splices minimum of 2". Provide in maximum length possible to minimize number of splices. Apply bituminous paint to concealed surfaces in contact with dissimilar metal, concrete or mortar. Set sub-sill in continuous bed of sealant and seal around all anchors penetrating sub-sill. Do not anchor window sill through sub-sill for openings 5' or less in width. For windows greater than 5' in width, anchor window sill through sub-sill at manufacturer required locations. Fill screw holes to full depth with sealant and install anchor. Apply 2 ribbons of sealant at 2" lap. Finish shall match aluminum frame.

2.07 ALUMINUM FLASHING MATERIAL

- A. Aluminum Sheet: Provide 3003-0 alloy for flashings.
- B. Finish:
 - 1. Color Anodic Coating, Class 1: AAM10C22A44 (Dark Bronze) coating electrolytically deposited complying with AAMA 606.1, 0.7 mil thick minimum.

2.08 OTHER MATERIALS

- A. Provide all other materials, not specifically described but required for a complete, weathertight, and proper installation of doors, windows, and framing systems, subject to acceptance by the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. With installer present, examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work:
 - 1. Verify rough opening dimensions.
 - 2. Verify levelness of sill plate.
 - 3. Verify operational clearances.
 - 4. Examine all relative wall flashing, vapor retarders, water and weather barriers, and other built-in components for proper water management.
 - 5. Masonry Surfaces:
 - a. Masonry surfaces must be visibly dry and free of excess mortar, sand, and other construction debris.
 - 6. Wood Frame Walls:
 - a. Wood frame walls must be dry, clean, sound, well nailed, free of voids, and without offsets at joints.
 - b. Ensure that nail heads are driven flush with surfaces in opening and within 3" of opening.
 - 7. Metal Surfaces:
 - a. Metal surfaces must be dry and clean (free of grease, oil, dirt, rust, corrosion, and welding slag).
 - b. Ensure that metal surfaces are without sharp edges or offsets at joints.
- B. Proceed with installation only after correcting unsatisfactory conditions.

3.02 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.
- B. Install aluminum-framed storefront system so that components:
 - 1. Are level, plumb, square, and true to line
 - 2. Are without distortion and do not impede thermal movement
 - 3. Are anchored securely in place to structural support
 - 4. Are in proper relation to wall flashing and other adjacent construction
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.
- D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.02 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured.
 - 2. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
 - 3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
 - 4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
 - 5. Air Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E 783.
 - b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - 6. Water Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E 1105.
 - b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf.
- B. Manufacturer's Field Services:
 - 1. Upon owner's written request, provide periodic site visit by manufacturer's field service representative.

3.02 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjusting: Not applicable.
- B. Protection:
 - 1. Protect installed product's finish surfaces from damage during construction.
- C. Cleaning:
 - 1. Clean glass immediately after installation.
 - a. Comply with glass manufacturer's written recommendations for final cleaning and maintenance.
 - b. Remove non-permanent labels and clean surfaces.
 - 2. Clean aluminum surfaces.
 - 3. Avoid damaging protective coatings and finishes.
 - 4. Remove excess sealants, glazing materials, dirt, and other substances.
 - 5. Repair or replace damaged installed products.
 - 6. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
 - 7. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 08 41 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
1. Swinging doors.
 2. Sliding doors.
 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
 2. Electromechanical door hardware.
 3. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 01 Section "General Conditions".
 2. Division 06 Section "Rough Carpentry".
 3. Division 06 Section "Finish Carpentry".
 4. Division 08 Section "Operations and Maintenance".
 5. Division 08 Section "Hollow Metal Doors and Frames".
 6. Division 08 Section "Flush Wood Doors".
 7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 8. Division 26 Section "Electrical"
- D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 2. ICC/IBC - International Building Code.
 3. NFPA 70 - National Electrical Code.
 4. NFPA 80 - Fire Doors and Windows.
 5. NFPA 101 - Life Safety Code.
 6. NFPA 105 - Installation of Smoke Door Assemblies.
 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
1. ANSI/BHMA Certified Product Standards - A156 Series.
 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

- a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
- 5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Manufacturers:
 - a. McKinney (MK) - QC (# wires) Option.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.
 - 2. Manufacturers:
 - a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.

3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Rockwood (RO).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 6. Manufacturers:
 - a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Manufacturer's Standard.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New System: Key locks to a new key system as directed by the Owner.
- D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

- a. Medeco (MC).

2.7 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical locksets shall have the following functions and features:

- a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
- b. Self-contained, continuous duty integral solenoid.
- c. One-year limited warranty on electrified functions.

2. Manufacturers:

- a. ASSA ABLOY ACCENTRA (YA) 4700LN Series.

- B. Cylindrical Indicator Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed. Listed manufacturers shall meet all functions and features as specified herein.
 - 1. Provide locksets with functions and features as follows:
 - a. Visual status indicators in rose, displaying bold visuals for vacant or occupied lock status.
 - b. Meets ANSI/BHMA A156.41 for single motion egress.
 - c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - d. Three-year limited warranty.
 - 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - YPL Series.

2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide locksets with functions and features as follows:
 - a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - c. Five-year limited warranty for mechanical features.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - 6000 Series.

2.10 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA (YA) - 4400 Series.
 - b. Corbin Russwin Hardware (RU) - DC6000 Series.
 - c. Norton Rixson (NO) - 7500 Series.
 - d. Sargent Manufacturing (SA) - 351 Series.

2.11 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.
1. Manufacturers:
 - a. Norton Rixson (NO) - 900 Series.
 - b. Sargent Manufacturing (SA) - 1560 Series.

2.12 DOOR STOPS AND HOLDERS

- A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
1. Manufacturers:
 - a. Rockwood (RO).
- B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
 - a. Norton Rixson (NO).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. Pemko (PE).

2.14 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architects of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Paint prime coated mullions to match frames.
- C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

- F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- G. Storage: Provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 08 71 00

PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Furnish and install glass and glazing materials and accessories for both factory and field glazed assemblies specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples:
 - 1. Size: 305 mm by 305 mm (12 inches by 12 inches) of each type specified.
 - 2. Tinted glass.
 - 3. Reflective glass.
 - 4. Transparent (one way vision glass) mirrors.
 - 5. Colored glass.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
- F. Qualification Data: For installers.
- G. Product Test Reports: For each of the following types of glazing products.
 - 1. Tinted float glass.
 - 2. Coated float glass.
 - 3. Insulating glass.

- H. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

- A. Sustainable Design Certification: Glass shall be Cradle to Cradle Certified, minimum Level, Cradle to Cradle Innovation Institute.
- B. Fabricator Qualifications: Vitro Certified Fabricator Network, as acceptable to the manufacturer.
- C. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level-2 (Senior Glaziers) or Level-3 (Master Glaziers).
- D. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: Clear float glass, coated float glass and insulating glass.
- E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- F. Glazing Publications: Comply with published recommendations of glass product manufacturers and industry organizations, including but not limited to those below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. FGIA Publication for Insulating Glass: SFGIA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units".
 2. NGA Publications: "Laminated Glazing Reference Manual"; "GANA Glazing Manual".
 3. FGIA Publications for Insulation Glass: AAMA "Sloped Glazing Guidelines".
- G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
 3. Fenestration and Glazing Industry Alliance.
- H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, Fenestration and Glazing Industry Alliance ANSI Z97.1.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 2. Lites more than 9 sq ft in area are required to be Category II materials.

3. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sf in area, provide glazing products that comply with Category II materials, and for lites 9 SF or less in area, provide glazing products that comply with Category I or II materials.
- I. Applicable Standards For Glass and Glazing Work: Conform to the "Manual of Glazing" of the Flat Glass Marketing Association, requirements of Federal Specification DD-G-451c and Safety Standard 16 CFR 1201 of the U.S. Consumer Products Safety Commission.
- J. Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.

1.05 APPLICABLE PUBLICATIONS

- A. ANSI Z97.1: Safety Glazing Material Used in Building Safety Performance Specifications and Methods of Test.
- B. ASTM C1036 - Standard Specification for Flat Glass
- C. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass -- Kind HS, Kind FT Coated and Uncoated Glass.
- D. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.
- E. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate.
- F. ASTM C 1376 - Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.
- G. ASTM E 2188 - Standard Test Method for Insulating Glass Unit Performance.
- H. ASTM E 2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
- I. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- J. Code of Federal Regulations (CFR) - 16 CFR 1201-10 Safety Standard for Architectural Glazing Materials.
- K. International Building Code - Chapter 24: Glass and Glazing

1.06 DELIVERY, STORAGE AND HANDLING

- A. Protection: Protect glass and glazing materials before, during, and after installation. Protect installed work and materials of other trades.
- B. Storage and Protection: Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.
- C. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturer: Vitro Architectural Glass; Glass Technology Center, 400 Guys Run Rd., Cheswick, PA 15024. ASD. Toll Free Tel: (855) 887-6457. Fax: (800) 367-2986. Web: <http://www.vitroglazings.com>

2.02 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. **Fabrication Process:** By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 - 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat- strengthened) float glass where safety glass is indicated or required.
- C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and complying with other requirements specified.
- D. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.

- E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 2188 / E 2189 for and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated or required.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Comply with requirements in Section 07920 - Joint Sealants. Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
 5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Aluminum with mill or clear anodic finish.
 - b. Desiccant: Molecular sieve or silica gel, or blend of both.
 - c. Corner Construction: Manufacturer's standard corner construction.

2.03 GLASS TYPES

- A. No manufacturer logos are allowed on any glass, except as required by governing codes and standards. Provide certification to General Contractor that tempered, heat strengthened, annealed, laminated, etc. glass was used where required.
- B. Annealed float glass shall comply with ASTM C1036, Type I, Class 1 (clear), Class 2 (tinted), Quality-Q3.
- C. Heat-Strengthened float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind HS.
- D. Tempered float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind FT.
- E. Heat-treated glass with elastomeric coating complying with ASTM C1048, Condition C (other coated glass), Type I (transparent glass, flat), Quality Q3 (glazing select) and with other requirements as specified.
- F. GANA/GTA 89-1-31, "Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Spandrel Glass with Applied Opacifiers", and with other requirements as specified.
- G. Provide type glass and thickness required and as follows:
1. **Clear Annealed Float Glass:** 1/4" thick unless otherwise shown.

2. **Clear Tempered Float Glass:** 1/4" thick unless otherwise shown. Conform to Safety Standard 16 CFR 1201 of the Consumer Products Safety Commission.
3. **"Low-E" Coating:** Vitro Architectural Glass Solarban® 70 (2) + Clear, VLT 64, SHGC 0.27, Insulating Glass Unit (IGU) or approved equal.

2.04 HERMETICALLY SEALED INSULATING GLASS ASSEMBLIES

- A. Manufacturer is used in this section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced standards.
 1. Guardian Industries
 2. Oldcastle Glass
 3. Pilkington
 4. Viracon Architectural Glass
 5. Vitro Architectural Glass
 6. Approved equal
- B. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
- C. The following are assemblies comprised of the components listed above.
 1. **"Low-E" Coated Tinted/Tempered Assembly:** 1" thick panels consisting of 1/4" clear tempered float glass on interior and 1/4" thick tinted tempered float glass on exterior with 1/2" air space and coating on #2 surface.
 2. **"Low-E" Coated Tinted/Heat-Strengthened Assembly:** 1" thick panels consisting of 1/4" clear annealed float glass on interior and 1/4" thick tinted float glass on exterior with 1/2" air space and coating on #2 surface.
 5. **Clear/Tempered Assembly:** 1" thick panels consisting of 1/4" clear tempered float glass on interior and 1/4" thick clear tempered float glass on exterior with 1/2" air space.
 6. **Clear/Annealed Assembly:** 1" thick panels consisting of 1/4" clear annealed float glass on interior and 1/4" thick clear annealed float glass on exterior with 1/2" air space.
 7. **Spacers:** Aluminum in Black Finish. Verify color selection with architect before fabrication.

2.05 FLAT GLASS

- A. Flat Glass:
 1. Shall comply with ASTM C1036-25 Standard Specification for Flat Glass, Type 1, Class 1, (clear) or Class 2 (tinted, heat-absorbing and light-reducing) and Quality Q3 (Glazing Select).
 2. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT (remove ASTM Standard C 1048 if annealed glass), Condition A (un-coated), B (spandrel glass, one surface coated), or C (other coated glass).

- a. Heated Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
 - b. Maximum peak-to-valley rollerwave 0.003" in the central area and 0.008" within 10.5' of the leading and trailing edge.
 - c. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or - 100mD (millidiopter) over 95% of the glass surface.
 - d. Maximum bow and warp 1/32" per lineal foot.
 - e. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
 - f. For all fully tempered glass, provide heat soak testing conforming to EN14179 which includes a 2 hour dwell at 290°C±10°C.
 - g. ASTM C 1172 Specification for Laminated Architectural Flat Glass.
- B. Glass Inspection Standards:
- 1. Any flaws that develop as a result of the manufacturing or handling process are inspected using the most current Glass Industry Standards:
 - a. ASTM C1036 for Flat Glass.
 - b. ASTM C1048 for Heat Treated Glass.
 - c. ASTM C1376 for Low-E Coatings on Flat Glass.
 - d. ASTM C 1651 Roll Wave Optical Distortion for Heat Treated Glass.
 - e. ASTM C 1503 for Mirrors.
 - f. ASTM C 1172 for Laminating Process Blemishes.
 - g. **Safety Glazing:** CPSC 16 CFR 1201 and ANSI Z97.1.
 - h. The Standards herein at a minimum meet that of ASTM or have tighter tolerances.
 - 2. Surface imperfections: All inspections shall be done with the viewing angle at 90 degrees to the glass surface, uniform diffused lighting that simulates daylight, and with the inspector looking thru rather than at the glass surface.
 - 3. At the request of the architect, provide inspection reports

2.06 GLAZING ACCESSORIES

- A. Provide glazing accessories required to complete glazing work that are compatible with various components of the glazing system(s), and subject to approval of Architect.
- B. Glazing Sealants: Provide Tremco "Proglaze", Bostik "Chem-Calk 2000", Pecora "836", Dow Corning Silicon 795, or approved equal. Color to be selected by Architect from manufacturer's standard line.
- C. Glazing Tapes: Provide Tremco "Pre-shimmed 440", Bostik "Chem Tape 60", Pecora "Shim-Seal", or approved equal. Color to be selected by Architect from manufacturer's standard line.
- D. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealants.

- E. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness and tested for compatibility with specified glazing sealants.
- F. Compressible Filler Rod: Closed-cell or waterproof jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25% deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.

PART 3 - EXECUTION

3.01 GLASS SIZES

- A. Measure sizes for glass from actual frames, doors and windows. Contract requires glass to be set in place, and Contractor assumes responsibility for correct sizes. Use sizes shown on Drawings for estimating only as approximate dimensions.

3.02 GLAZING SURFACES

- A. Glaze only dry surfaces, free from dust or ice. Clean dirty surfaces with cloth saturated with turpentine or mineral spirits before glazing. Remove loose dirt particles and mortar from recesses prior to installation of glass and glazing materials.

3.03 SETTING GLASS

- A. Set glass to provide equal bearing for entire width of each pane. Contractor responsible for broken glass due to improper setting. Set using glazing stops furnished by door or fixed framing manufacturer unless otherwise shown or specified. Accurately set glass to fit frame, with all edges smooth. Sharp ragged edges are not acceptable. Cushion glass in fixed interior view windows with felt strips around entire perimeter.

3.04 CLEANING GLASS

- A. Contractor shall employ services of a professional window washer at completion of all work to wash glass which has been installed under this contract, removing all stains.
- B. Clean glass on both sides after painting operations are complete and dry. Do not use acid solutions or caustic soaps to clean glass.
- C. Do not use razor blades to clean glass. Any scratches on the glass caused by the cleaning process will be cause for the removal and replacement of the damaged glass at the Contractor's expense.

END OF SECTION 08 80 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide metal supports and fastenings, gypsum board, and related accessories specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Qualifications of Installers: Use only skilled and experienced gypsum drywall installers. Fully supervise at all times helpers and apprentices used for drywall work with thoroughly skilled gypsum drywall installers.
- B. Manufacturers' Recommendations: Manufacturers' recommended use of materials, fastenings, and methods of installation is basis for acceptance or rejection of drywall and cementitious backer units work where not specifically otherwise shown or detailed.

1.05 REFERENCE STANDARDS

- A. Aluminum Association:
 - 1. Designation for Aluminum Finishes
- B. American Society for Testing and Materials International (ASTM):
 - 1. ASTM C475/C475M, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 2. ASTM C514, Specification for Nails for the Application of Gypsum Board.
 - 3. ASTM C557, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - 4. ASTM C645 Standard Specification for Nonstructural Framing Members .
 - 5. ASTM C840, Specification for Application and Finishing of Gypsum Board.

6. ASTM C954, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness.
7. ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
8. ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
9. ASTM C1177/C1177M, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
10. ASTM C1178/C1178M, Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
11. ASTM C1280, Specification for Application of Gypsum Sheathing Board.
12. ASTM C1396/C1396M, Standard Specification for Gypsum Board.
13. ASTM C1629/C1629M, Standard Classification for Abuse-Resistant Non-decorated Interior Gypsum Panel Products & Fiber-Reinforced Cement Panels.
14. ASTM C1658/C1658M, Standard Specification for Glass Mat Gypsum Panels.
15. ASTM D3273, Standard test Method for Resistance to Growth of Mold on the Surface on Interior Coatings in an Environmental Chamber.
16. ASTM C1766 Standard Specification for Factory-Laminated Gypsum Panel Products.

C. Gypsum Association:

1. GA-216, Specification for the Application and Finishing of Gypsum Panel Products.
 - a. A control joint shall be installed where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the base building structure.
 - b. Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
 - c. Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft.
 - d. Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
 - e. Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
2. GA-214, Levels of Finish for Gypsum Panel Products.
3. GA-253, Application of Gypsum Sheathing.
4. GA-600-2024, "Fire Resistance Design Manual".
5. GA-800, "Materials Handling Manual".
6. GA-234-2019, "Control Joints for Fire-Resistance Rated Systems".

- D. International Organization for Standardization:
 - 1. ISO 14024- Environmental Labels and Declaration, Type I Environmental Labeling Principles and Procedures
 - 2. ISO 14025 - Environmental Labels and Declarations, Type III Environmental Declarations Principles and Procedures
- E. Underwriters' Laboratories of Canada (ULC):
 - 1. ULC-S101, Fire Endurance Tests of Building Construction and Materials
 - 2. ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies
 - 3. ULC-S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- B. Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.
- D. Replacements: In event of damage, immediately make repairs and replacements necessary and at Contractor's expense.

1.07 WASTE MANAGEMENT AND DISPOSAL

- A. Separate and recycle waste materials in accordance with standard practices.
- B. Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- C. Do not dispose of unused paint and caulking materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.01 GYPSUM MATERIALS

- A. **Manufacturers:** Use products and materials by one of the following manufacturers:
 - 1. Certaineed
 - 2. National Gypsum Company
 - 3. Georgia-Pacific Company

4. Temple-Inland, Inc.
 5. United States Gypsum
 6. James Hardie Building Products
 7. Approved Equal
- B. **Gypsum Wallboard:** Conform to ASTM C1396, have tapered edges and furnished in largest practical sheet size to minimize number of joints. Provide thickness as indicated on Drawings; typically provide 5/8" thickness at walls.
- C. **Finish:** In general, all gypsum board walls are to be taped and floated for a smooth finish. A slight egg-shell texture may be acceptable if approved by Architect prior to application. Heavy "knockdown" texturing is not acceptable.
1. All screw and/or nail heads are to be floated smooth both above and below ceiling line.
 2. Refer to Drywall Finishing Council document titled, "Recommended Specification For Preparation of Gypsum Board Surfaces Prior To Texture Application. When subjected to critical lighting, a Level 5 gypsum board finish as defined in GA-214-2021 ("Levels of Finish for Gypsum Panel Products") is recommended.
 3. For Levels 3, 4, and 5, job-site mock-up(s) shall be used to determine acceptance of the finish within the building. The design professional shall specify the mockup procedure and mock-up construction details within the project documents, unless waived in writing. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. **Use Level 4 finish for all finished areas open to public view.** Level 5 skim coating is required at areas exposed to severe lighting conditions, gloss, semi-gloss, or enamel paint applications. Refer to the drawings for specific area locations.

2.02 ACOUSTICAL INSULATION

- A. In partitions, provide un-faced Owens-Corning Sound Attenuation Batt (SABs) Insulation, or approved equal, complying with ASTM C 665, Type I and ASTM E 136. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested complying with ASTM E 84.

2.06 FASTENERS

- A. Nails (for application of gypsum board to wood): Annular ringed nails No. GWB-54, 1-1/4" long for single layer application.
- B. Furring Anchorages: 16-gage galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws as recommended by furring manufacturer and complying with C754.

2.07 ACCESSORIES

- A. Casing Bead: "Goldbond" No.500 galvanized steel by National Gypsum Co., or approved

equal. Furnish and install metal reveal strips where shown and detailed.

- B. Corner Beads: 0.014 inch thick, hot dip galvanized steel with 1" flanges with 1/16" radius nose with large openings in flange similar to 5/8" diameter holes 7/8" on center.
- C. Control and Expansion Joints: "Sheetrock" zinc control joint No.093 by USG, or approved equal. Provide safig and/or acoustical insulation behind control joints as required for adjacent partition construction. Use fire rated control joints in partitions requiring a fire rating.

2.08 ACCESS PANELS AND FRAMES

- A. Manufacturer: Milcor Limited Partnership, 1150 North Cable Road, Lima, OH 45805, 1-800-528-1411 or approved equal.
 - 1. BAUCO Access Panel Solutions, Inc., (877) 592-0033.
- B. Ceiling Access Doors (in non-rated gypsum board ceilings): Provide Milcor style "DW", Model No. 3203-019 or approved equal. Provide 24" x 24" door size with screwdriver-operated, flush, cam-type locks. Furnish with factory prime coat.
- C. Wall Access: Provide 24" x 24" Model KDW Flush Access Door as manufactured by Karp Associates, Inc., 1-800-888-4212 or approved equal.
- D. **Access Locations:** Install removable access panels directly below each valve, flow indicator, damper, air splitter or other utility requiring access that is located above ceilings, other than at acoustical panel ceilings, and that would otherwise not be accessible. Install access doors and panels permitting access to service valves, traps, dampers, clean-outs, and other mechanical, electrical and conveyor control items concealed in walls and partitions. Verify types, fastening and locations with architect during shop drawing review submission.
 - 1. When possible, avoid locating access panels in wet areas. When such locations cannot be avoided, provide moisture resistant assemblies.
 - 2. Install fire-rated access doors in fire-rated partitions and ceilings in accordance with NFPA 80.

2.09 OTHER MATERIALS

- A. Provide materials, not specifically described but required for complete and proper installation of gypsum drywall, selected by Contractor subject to approval of Architect.

PART 3 - EXECUTION

3.01 GENERAL PROVISIONS

- A. Comply with specified requirements, manufacturer's instructions and recommendations, and referenced standards.

- B. In cold weather, heat building to provide uniform temperature of 50° to 70° and provide ventilation to eliminate excess moisture.
- C. Deliver materials to job in original unopened containers or bundles and store protected from damage and exposure to the elements.
- D. Provide casing beads where edges of gypsum board meet dissimilar materials.
- E. Cooperate with carpenters in placing of backing and blocking required for millwork, fixtures, fittings, and accessories.
- F. Make cut-outs in panels for pipes, fixtures and small openings. Make holes and cut-outs by method that will not fracture wallboard core or tear covering. Cut holes with accuracy so plates, escutcheons and trim cover edges.
- G. Seal cut edges, holes, and areas where wallboard covering is broken, with resistant sealer.
- H. Install trim in strict accordance with manufacturers' recommendations. Install trim plumb, level, and true to line with firm attachment to supporting members.
- I. At any change in direction of gypsum board, provide sufficient auxiliary framing, blocking or nailers to allow secure attachment along every edge of every individual piece of gypsum board. Do not leave any loose edges.

3.02 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Pre-Installation Conference: Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed.
 - 1. At finished areas exposed to public view, encapsulate pipes, conduit, ductwork and similar utility components below ceiling levels, whether indicated on the drawings or not.
- B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate course of board.
- D. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".

- E. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs. Do not butt boards to concrete floor. Maintain a minimum 1/4" to a maximum 3/8" space between bottom of board and concrete.
- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- H. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts. Space between recessed boxes and cut edges shall not exceed 1/8 inches.
- I. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories described below in article entitled "INSTALLATION OF DRYWALL TRIM ACCESSORIES".
- J. Cover both faces of partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase wall which are braced internally.
- K. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.04 INSTALLATION OF CEILING ACCESS PANELS

- A. General Contractor is required to coordinate locations and number of access panels with affected trades in order to minimize the number of access panels required.
- B. Provide ceiling access panels in gypsum board ceilings as specified. Provide quantity required for access to the following items commonly found above the ceiling plain:
 - 1. Operable portion of fire, smoke and other dampers
 - 2. Valves and other operable portions of sprinkler system
 - 3. Valves to mechanical, domestic and other piping systems
 - 4. Mechanical devices
 - 5. Fire alarm devices
 - 6. Communication system devices and connection points
 - 7. Sanitary and storm sewer clean outs
 - 8. Also included are any other items located above an otherwise inaccessible ceiling that will require adjustment, maintenance, inspection, connection or replacement in whole or in part at any time after the initial installation of the item or the ceiling.

3.05 METHODS OF GYPSUM BOARD APPLICATION

- A. On ceilings:
 - 1. Apply gypsum board prior to wall/partition board application to the greatest extent possible. For single-ply construction, use perpendicular application. For two-ply assemblies use perpendicular application and apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.
 - 2. For applications on wood or other applications, refer to Gypsum Association GA-216 for fastener type and spacing.
- B. On partitions except shaft wall:
 - 1. Use maximum length sheets practical to minimize end joints.
 - 2. When gypsum board is installed parallel to framing members, space fasteners 12 inches on center in field of the board, and 8 inches on center along edges.
 - 3. For applications on wood or other applications, refer to Gypsum Association GA-216 for fastener type and spacing.
 - 4. When gypsum board is installed perpendicular to framing members, space fasteners 12 inches on center in field and along edges.
 - 5. Stagger screws on abutting edges or ends.
 - 6. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
 - 7. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
 - 8. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

3.06 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install metal corner beads at external corners of drywall work. Corner beads are to be completely bedded and taped.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

- D. Install metal control joints where indicated on drawings. If not indicated on drawings, install in accordance with the following:
 - 1. Interior Partitions: Maximum Single Dimension not to exceed 20 feet. Maximum Single Area not to exceed 400 SF.
 - 2. Interior Ceiling With Perimeter Relief: Maximum Single Dimension not to exceed 40 feet. Maximum Single Area not to exceed 1,600 SF. Install control joint at any change of direction of ceiling framing or support system.
 - 3. Interior Ceiling Without Perimeter Relief: Maximum Single Dimension not to exceed 20 feet. Maximum Single Area not to exceed 400 SF. Install control joint at any change of direction of ceiling framing or support system.

3.07 INSTALLATION ON WOOD

- A. Install gypsum board on wood blocking and wood furring by double nailing using annular ringed nails specified in Part 2 of this Section. Space nails not less than 3/8" from ends and edges of wallboard. Hold wallboard in firm contact with nailing member while nails are being driven. Dimple heads slightly below surface of wallboard with final hammer blow, taking care not to break the paper face.

3.08 JOINT TREATMENT

- A. General: Joint treatment for gypsum board surfaces is also described in Section 09 91 00 and may be performed under either the gypsum board or painting subcontract.
- B. **All joints in gypsum board construction are to be taped and floated. This includes work above ceilings, at concealed places and anywhere else joints in gypsum board construction occur.**

3.09 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
 - 1. Gypsum board is fastened and held close to framing or furring.
 - 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the construction.

3.10 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including non-decorated surfaces.
- B. Patch holes or openings 1/2-inch or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 1/2-inch diameter, or equivalent size, with 5/8-inch thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction, where applicable.

3.09 INSTALLATION

- A. ASTM C840-08 or GA-216-2024 provides the following requirements for installing control joints in gypsum board assemblies:
 - 1. Section 20.2 (GA 4.7.1.1 & GA 4.7.2) – Control joints shall be installed where indicated on the plans. Full height door frames shall be considered equivalent to a control joint.
 - 2. Section 20.3 (GA 4.7.3) – Control joints in the gypsum board shall be specified by the architect or designer where any of the conditions described in 20.3.1-20.3.5 exist (GA 4.7.3.1 – 4.7.3.7).
 - 3. Section 20.3.1 (GA 4.7.3.1) – A control joint shall be installed where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the base building structure.
 - 4. Section 20.3.2 (GA 4.7.3.2) – Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
 - 5. Section 20.3.3 (GA 4.7.3.3) – Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft.
 - 6. Section 20.3.4 (GA 4.7.3.4) – Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
 - 7. Section 20.3.5 (GA 4.7.3.5) – Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.
 - 8. Section 20.3.6 (GA 4.7.3.6) – A control joint or intermediate blocking shall be installed where ceiling framing members change direction.
 - 9. Section 20.3.7 (GA 4.7.3.7) – Control joints shall be installed where specified by the architect or designer as a design accent or architectural feature.

10. Section 20.4 (GA 4.7.4) – Where a control joint occurs in an acoustical or fire-rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8 in. type X gypsum board, mineral fiber, or other tested equivalent.

3.10 CLEANING UP

- A. Do not allow accumulation of scraps and debris arising from work of this Section. Maintain premises in neat and orderly condition at all times. Immediately remove spilled or splashed compound material and all trace of residue from adjoining surfaces.

END OF SECTION 09 21 16

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install resilient base and accessories specified. Clean and protect resilient components after installation.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.
- E. Installation and Maintenance Instructions: Submit manufacturer's published guide for Resilient Top-Set Wall Base.
- F. If required, submit the manufacturer's certification that the wall base has been tested by an independent laboratory and complies with the required fire tests.

1.04 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 various flooring materials specified. An installer is "qualified" if trained, or a certified by manufacturer or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver resilient base and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. 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 (13 deg C) or more than 85 deg F (29 deg C).
- C. Protect products from damage when handling and during construction operations.

1.06 PROJECT CONDITIONS

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.07 EXTRA MATERIALS

- A. Deliver to the Owner / Facility Manager maintenance stock, from the same manufactured lot as materials installed. Furnish 120 LF (one carton) for each color and type of wall base installed, and packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.01 RESILIENT WALL BASE

- A. Manufacturer: Johnsonite, Inc., (800) 899-8916, 16910 Munn Road, Chagrin Falls, Ohio 44023. Web: www.tarkettna.com or approved equal.
 - 1. Mannington BurkeBase
 - 2. Roppe

- B. Furnish homogeneous 4" high, 1/8" thick, set-on type coved base in color(s) selected by Architect. Pre-molded corner units may be used at installer discretion if conditions warrant, but do not place where routine cleaning operations may cause corners to come loose.
 - 1. Traditional Rubber Wall Base
 - a. Manufactured from a proprietary thermoplastic rubber formulation.
 - b. Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1.
 - c. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
 - d. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
 - e. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1 1/4" diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.
 - f. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.
 - g. Phthalate-free.
 - h. Contains at least 14% pre-consumer recycled content.
 - i. 100% Recyclable.

2.02 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation manufactured and warranted by a reputable manufacturer.
- B. Adhesives: as recommended by Johnsonite to meet site conditions.
 - 1. Johnsonite 960™ Cove Base Adhesive or approved equal for cleaned and prepped porous surfaces. DO NOT USE AT OUTSIDE CORNER INSTALLATIONS.
 - 2. Johnsonite 946™ Premium Contact Adhesive or approved equal for cleaned and prepped non-porous surfaces such as stainless steel. PREFERRED PRODUCT.
 - a. Use at outside corners to ensure faster set-up, especially at short returns.
 - 3. ULTRASTIK™ All Purpose Tape which is double-sided, scrim-reinforced acrylic adhesive tape for applying base trim, as manufactured by Surface Shields.

2.03 OTHER MATERIALS

- A. Provide materials, including adhesives, not specifically described but required for complete and proper installation of resilient flooring only as recommended by manufacturer of material to which it is applied and subject to approval of Architect.
- B. Covebase Groover recommendation: Model CB-060 as provided by D-Cut Products, Inc., for fabricating outside corners, (630) 916-9100 www.dcutproducts.com

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion and aesthetics of resilient products.
 - 1. **Where existing base material has been removed at existing porous and non-porous wall surfaces, scrape or remove cured adhesives, contact cement or drywall joint compound so that there is a clean and smooth surface before installing new base material.**
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient wall base.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's published instructions for installing resilient base. Refer to Installation Video: <https://www.youtube.com/watch?v=QCp2MunOCOY>
For any installation questions call Johnsonite Technical Hotline: 800-899-8916.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths if practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

- F. Preformed corners: Install preformed Outside Corners where utilized before installing straight pieces.
- G. Field-Made or Job Formed Corners (recommendation):
 - 1. Outside and Inside Corners: Install pre-mitered corners first. Seat the bottom of the wall base snugly to the floor on either side of the corner. Anaerobic adhesive (Super Glue) may be used to adhere the two mitered pieces together. This can eliminate any slight gapping. Butt straight pieces of maximum lengths on either side of the pre-mitered corners. Make sure heights of the corner returns and the straight base match up.
 - 2. Outside corners: Form by bending without producing discoloration (whitening) at bends. DO NOT WHITTLE.
 - a. Fold base in half.
 - b. Make one continuous cut with a sharp cove base gouger or groover.
 - c. Shave both sides, starting halfway down and avoid cutting into original center cut.
 - d. Fold tightly; groove out remaining upper portion. Nip top then affix to wall with Johnsonite 946™ Premium Contact Adhesive.
 - 3. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 13

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install resilient flooring. Clean and protect resilient floor areas after installation.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings:
1. Layout of patterns as shown on the construction documents.
 2. Edge strip locations showing types and detail cross sections.

1.04 REFERENCES

- A. ASTM Designations:
1. ASTM E 492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine
 2. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 3. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 4. ASTM E 989 - Standard Classification for Determination of Impact Insulation Class (IIC)
 5. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
 6. ASTM F 141 - Standard Terminology Relating to Resilient Floor Coverings
 7. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 8. ASTM F 1482 - Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
 9. ASTM F 1700 - Standard Specification for Solid Vinyl Floor Tile

10. ASTM F 1861 - Standard Specification for Resilient Wall Base
11. ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
12. ASTM F 2170-19a - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
13. ASTM F 2419 - Standard Practice for Installation of Thick Poured Gypsum Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring
14. ASTM F 2471 - Standard Practice for Installation of Thick Poured Lightweight Cellular Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring
15. ASTM F 2678 - Standard Practice for Preparing Panel Underlayments, Thick Poured Gypsum Concrete Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring
16. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.05 QUALITY ASSURANCE

- A. Obtain each type, color, and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Qualifications of Installers: Use only skilled and experienced resilient flooring installers for preparation of substrate and installation of flooring. Supervise helpers and apprentices at all times with thoroughly skilled resilient flooring installers.
- C. Manufacturers' Recommendations: Manufacturers' recommended methods of installation and the referenced applicable standards is basis for installation methods used on this work.
- D. Applicable Standards:
 1. Federal Specifications:
 - (a) SS-T-312B Tile, Floor: Asphalt, Rubber, Vinyl-Composition.
 - (b) SS-W-40A Wall Base: Rubber and Vinyl Plastic.
 2. Resilient Tile Institute:
 - (a) Recommended Installation Specifications for Vinyl Composition Tile Flooring and Asphalt Tile Flooring.
 3. Rubber Manufacturer's Association:
 - (a) Manual for the Preparation of Subfloors for the Installation of Solid Vinyl and Rubber Flooring.
 - (b) Specifications for Flexible Vinyl Cove Base.
 - (c) Specifications for Rubber Cover Base.
 - (d) Specifications for Solid Vinyl Flooring.
 4. Conform to ADA requirements for slip resistance by providing minimum coefficients of sliding friction of 0.6 COF for horizontal surfaces and 0.8 COF for ramps and other sloped surfaces.

- E. **Mockup:** Build floor tile mockup to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Size: 100 sq. ft. for each type, color, and pattern. Locations as indicated on construction documents.
 - 2. Design Professional approved mockup may become part of the completed Project if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver flooring and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Store flooring materials on flat surfaces. Move flooring and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.07 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install flooring until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during installation.

1.08 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.
- B. Do not install flooring over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by flooring manufacturer's recommended bond and moisture test.

1.09 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials, totaling 3% of the total installed, matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.01 LUXURY VINYL TILE

- A. Refer to the Room Finish Schedule and Product Schedule on the drawings.
- B. Wet spread to be backing-specific manufacturer's adhesives for non-porous sub-floor. Provide Limited Commercial Warranty against excessive surface wear, static, delamination, edge ravel, zippering and backing resiliency loss.

2.02 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated. Provide materials for filling cracks and leveling floor depressions by Mapei, or approved equal.
- C. Adhesives: Water-resistant type recommended by flooring manufacturer to suit resilient flooring products and substrate conditions indicated, if required.
 - 1. Provide HENRY® 695 premium, high-strength adhesive for the permanent installation of vinyl-backed flooring as both a wet-set and a pressure-sensitive adhesive, or approved equal.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of flooring, and in maximum available lengths to minimize running joints.
- E. Furnish beveled edge strips 1-1/8" wide where resilient flooring adjoins other floor finish of lower level.
- F. Provide Schluter®-DILEX-EKSB Series Surface Joint Profile transition strip in floor tile at all saw-cut or screed key joints in concrete, new or existing. Finish shall be stainless steel or color as selected by the design professional.

2.03 OTHER MATERIALS

- A. Provide materials, including adhesives and moisture vapor barrier, not specifically described but required for complete and proper installation of resilient flooring only as recommended by manufacturer of material to which it is applied and subject to approval of Architect.
 - 1. ARDEX VB 100™ Fast-Track, One-Component Moisture Vapor Barrier or approved equal. Install per manufacturer published recommendations.
- B. **Metal Transition Profiles:** Refer to drawings for size, types and finishes as manufactured by Küberit USA, LLC, (888) 284-7567. www.kuberitusa.com

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 - 4. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
 - 5. ASTM F710 - Practice for Preparing Concrete Floors. Concrete ph determination.

3.02 PREPARATION

- A. Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by flooring immediately before installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.03 TILE FLOORING INSTALLATION

- A. Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern as indicated on the drawings.
- D. Where demountable partitions and other items are indicated for installing on top of finished tile floor, install tile before these items are installed.
- E. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edging, thresholds, and nosing.
- F. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- H. Install 1-1/8" wide bullnose edging strips where edges of tile are exposed.
- I. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- J. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- K. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- L. Hand roll tiles where required by tile manufacturer.

3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by flooring manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient flooring manufacturer.

4. Damp-mop flooring to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.
1. Apply protective floor polish to flooring surfaces that are free from soil, visible adhesive, and surface blemishes.
 2. Use commercially available, metal, cross-linked acrylic product acceptable to flooring manufacturer.
 3. Coordinate selection of floor polish with Owner's maintenance service.
 4. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.
 5. Do not move heavy and sharp objects directly over flooring. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.
1. Strip protective floor polish that was applied after completing installation prior to cleaning.
 2. Reapply floor polish after cleaning.

3.05 PATCHING AND REPAIR OF EXISTING FLOORING

- A. Use matching resilient flooring for repair and replacement of existing flooring. Match existing flooring type, size, color, and pattern. Unbroken salvaged flooring may be re-used where necessary in patching existing floor areas which are to remain. General Contractor to coordinate cutting and patching requirements and execute flooring and other subcontract agreements so quantities of cutting and patching are taken into account in preparation of bids. No additional payment made by Owner for variations in cutting and patching required to perform the Work except where changes in Work are requested by Owner after Contract is executed.

END OF SECTION 09 65 19

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PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnish labor, materials, tools and equipment required and install interior high-performance resinous floor coating specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Subcontractor Qualifications: Use installer approved and licensed representative of manufacturer of materials used. Use mechanics experienced in commercial installation of materials used and factory trained and qualified by manufacturer.
- B. Single Source Responsibility: Obtain each color, grade, finish, type, composition, and variety of flooring material from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Field Constructed Mock-up: Before installing flooring, erect mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Locate mock-ups on site in location and size as directed by Architect.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Obtain Architect's acceptance of mock-ups before start of final unit of Work.
 - 4. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.
 - 5. When directed, demolish and remove mock-ups from Project site.

- E. Pre-Installation Conference: Conduct conference at Project site as directed by Architect.

1.05 REFERENCES

- A. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
- B. Surface Preparation: SSPC-SP13 Surface Preparation of Concrete, ICRI CSP3.
- C. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- D. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using portable Adhesion Testers.
- E. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.

1.06 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Maintain temperatures at 50°F (10°C) or more during installation and for 7 days after completion, unless higher temperatures are required by manufacturer's instructions.
- C. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.07 WARRANTY

- A. System manufacturer and system installer required to jointly warrant against bond failure, cracking, and deteriorations of seamless covering installed on structurally sound substrate for period of one year after acceptance of project and to replace, repair, or make good defective work or materials at Contractor's expense during warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Sherwin-Williams, Tel.: (800) 474-3794. Website: www.sherwin-williams.com

2.02 MATERIAL

- A. ARMORSEAL® 8100 is a two-component, water-based polyamine epoxy floor coating system.
 - 1. Part A: B70-8160 Series (Satin)
 - 2. Part B: B70V8100 (Hardener)
- B. Surface Preparation: Allow new concrete to cure a minimum of 28 days at 75°F. Abrade concrete according to SSPC-SP13 Surface Preparation of Concrete ICRI CSP3 or greater. Verify concrete dryness in accordance with ASTM F 1869, ASTM F 2170 or ASTM D 4263.
- C. Refer to published recommendations for each of the applications System Guide
- D. Performance Properties:
 - 1. VOC: <50 G/L
 - 2. Abrasion Resistance (ASTM D4060): 150 mg loss max.
 - 3. Adhesion (ASTM D4541): 550 psi to concrete.
 - 4. Finish: Gloss or Satin.
 - 5. Color: As selected by architect from complete line.
 - a. Tinting: Tint part A with CCE colorants at 100% strength. Five minutes minimum mixing on a mechanical shaker is required for complete mixing of color.

2.03 OTHER MATERIALS

- A. Provide materials not specifically described but required for complete and proper installation of seamless flooring of new, first quality of their respective kinds, in strict accordance with recommendations of manufacturer of flooring used, and subject to approval of Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and areas where flooring will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed flooring.
 - 1. Verify that substrates are firm, dry, clean, and free from oil or waxy films and curing compounds.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind flooring has been completed before installing flooring.
 - 3. Notify the Architect of any cracks or irregularities in the substrate that might telegraph through the flooring or cause it to crack.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General:

1. Initially, dislodge dirt, mortar spatter and other dry surface accumulations and contamination by scraping, brushing, sweeping, vacuuming or compressed air blow-down.
2. Surfaces that are heavily contaminated with petroleum or other process products shall be cleaned with the appropriate de-greaser, detergent or other effective cleaner/surfactant followed by thoroughly rinsing with fresh water to remove the accumulation prior to mechanical cleaning efforts. Mechanical cleaning will not remove such deposits, but will only drive them deeper.
3. All concrete floor surfaces shall be visibly dry, especially in cracks and other deep surface discontinuities, prior to commencing mechanical cleaning and preparation.

B. Mechanical Surface Preparation and Cleaning:

1. All accessible concrete floor surfaces shall be mechanically cleaned using a "BlastTrac" method or approved equivalent. All surface and embedded accumulations of paint, toppings, hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be removed leaving a bare concrete surface having a minimum profile of 30 mils and exposing the upper facades on concrete aggregate. (Reference SSPC-SP13 / NACE 6 or ICRI No. 310.2R, CSP1-3.
2. Floor areas that are inaccessible to the cleaning machine shall be mechanically abraded to the specified degree of cleanliness, soundness and profile using vertical disc scarifiers, starwheel scarifiers, grinders, needle guns or other suitable effective equipment.
3. Cracks in the floor 3/16" and wider, shall be shall be routed out to a minimum 1/2" deep V-groove of sound concrete and filled with materials recommended by the manufacturer. Other significant surface discontinuities such as holes, pits, depressions and exposed aggregate areas shall be filled with similar materials.
4. Allow the surface to dry or force dry with heat and circulating air to ensure that all surface, especially discontinuities, are visible dry.
5. All concrete floor terminations and leading edges shall be saw-cut and chiseled down to 1/4" to 1/2" to avoid feathered edge terminations. This includes drains, construction & expansion joints and all leading edges of concrete floor where they meet dissimilar materials.

3.03 INSTALLATION

A. Floor:

1. Mixing: Pre-mix Part A, add entire contents of Part B hardener, mix thoroughly with a low-speed drill for 3-5 minutes.

2. Application: Self-priming over sound concrete; apply minimum 2 coats of Armorseal 8100 at 2.0–4.0 mils dry film thickness (DFT) per coat via brush, roller, or squeegee.

3.04 INSPECTION

- A. All work that is not acceptable to the Architect, Engineer or Owner must be corrected before consideration of final acceptance.

3.05 CLEAN-UP

- A. Remove any material spatters and other material that is not where it should be. Remove masking and covers, taking care not to contaminate surrounding areas.
- B. Repair any damage that should arise from either the application effort or from the clean-up effort.

3.06 PROTECTION

- A. Protection: Keep foot traffic off the coated floor for at least 12–24 hours; allow 7 days for full chemical/cure hardening.

END OF SECTION 09 67 23

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PART 1 - GENERAL**1.01 DESCRIPTION**

- A. Work Included: Provide specified painting and finishing of interior and exterior items.
 - 1. Provide painting of all new exposed steel and iron work, including primed metal surfaces. Paint exposed-to-view pre-finished metal surfaces of items, if required. Refer to drawings for existing metal to be painted.
 - 2. Provide touch-up of pre-finished items to match original finish.
 - 3. **Do not paint** waterproof coatings, water repellent coating, acoustical ceilings, toilet partitions, aluminum with factory applied finish, or pre-finished items, except as noted above.
 - 4. **Do not paint** over any code required metal labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. Mask off the label before applying finish and remove masking after finish is dry.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 DEFINITIONS

- A. Term "paint", as used herein, includes enamels, paints, sealers, fillers, emulsions, varnishes, stains, and other coatings whether used as prime, intermediate, or finish coats.

1.05 QUALITY ASSURANCE

- A. Qualifications of Painters: Use only qualified journeyman painters for mixing and application of paint. In acceptance or rejection of painting, no allowance made for lack of skill on part of painters.

- B. Mockups - Interior: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 SF.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 PRODUCT HANDLING

- A. Delivery: Deliver paint materials to job site in original unopened containers with labels intact and legible at time of use.
- B. Protection:
 - 1. Store only approved materials at job site and store only in suitable and designated area restricted to storage of paint materials and related equipment.
 - 2. Ensure safe storage and use of paint materials and prompt and safe disposal of waste.
 - 3. Protect paint materials before, during, and after application and protect installed work and materials of other trades.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Manufacturers: Provide paints, enamels, stains, varnishes, and admixtures of first line quality by Sherwin Williams or approved equal. Sherwin Williams products specified herein establish minimum quality standards. Approved equal products:
 - 1. Farrell-Calhoun
 - 2. PPG Paints
 - 3. Benjamin Moore
- B. Compatibility:
 - 1. Paint materials and equipment to be compatible. Finish coats compatible with prime coats, prime coats compatible with surface to be coated, and tools and equipment compatible with coating applied.
 - 2. Thinners (when used): Use thinners recommended for that purpose by manufacturer of material thinned.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Carefully inspect installed work of other trades and verify work is complete to point where painting work may properly commence. Verify paint finishes may be applied in strict accordance with manufacturer's directions and requirements of these Specifications.
- B. Discrepancies: Do not proceed with installation in areas of discrepancy until discrepancies are fully resolved.

3.02 PREPARATION OF SURFACES

- A. Protection: Completely mask, remove, and adequately protect hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces not scheduled to receive paint.
- B. Priming: Use primer recommended by manufacturer of coating system. Spot prime exposed nails and metals to be painted with emulsion paints.
- C. Cleaning: Thoroughly clean surfaces receiving paint. Schedule cleaning and painting so dust and contaminants from cleaning process will not fall on wet, newly painted surfaces.
- D. Gypsum Board: Treat and conceal joints, screw heads, and depressions in gypsum board surface in accordance with manufacturer's recommendations and instructions. Painted surfaces must be completely clean and continuously smooth. Treat internal and exterior corners and angles formed by intersection of wallboard surfaces and wallboard edges with joint reinforcements system in accordance with manufacturer's standard installation specifications where intersections and edges do not have metal trim. **All joints in gypsum board construction are to be taped and floated. This includes work above ceilings, at concealed places and anywhere else joints in gypsum board construction occur.** A slight egg-shell texture may be acceptable if approved by Architect prior to application. **Heavy "knockdown" texturing is not acceptable.**
- E. Concrete and Concrete Block: Prepare surfaces in strict accordance with paint manufacturer's instructions and recommendations. Remove chalk, dust, dirt, grease, oils and substances which negatively effect paint adhesion. Perform appropriate tests to determine alkalinity and moisture content of surfaces. If surfaces are found sufficiently alkaline to cause blistering and burning of paint, correct condition before applying paint.
- F. Wood: Clean wood surfaces free of dirt, oil, or foreign substances with scrapers, mineral spirits, and sandpaper. Sandpaper smooth those surfaces exposed to view, and then remove dust. Prime or seal wood requiring job painting immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of this wood. Scrape and clean small, dry seasoned knots, and apply thin coat of white shellac or manufacturer's recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections

in finish surfaces with putty of plastic wood-filler. Sandpaper smooth when dried.

- G. Primed Ferrous Metals: Clean ferrous metals free of dust, grease and grime. Sand smooth rust spots, mars and abrasions in surfaces. Touch-up shop-applied prime coats which have damage or bare areas. Wire-brush, solvent clean, and touch up with same primer as shop coat.
- H. Non-ferrous Metals: Clean off all oxidation, dust, grease and grime.
- I. Galvanized Metal Surfaces: Clean free of oil and surface contaminates with acceptable non-petroleum based solvent. Touch up bare metal with zinc chromate primer.

3.03 WORKMANSHIP

- A. Do not perform outside painting in extremely cold, frosty, or damp weather. Do not paint in dusty rooms. If required, sprinkle floors, to lay dust. Do not apply coats of paint on either wet or damp surfaces and in no case unless preceding coat is dry and hard.
- B. Clean surfaces before priming. Remove dirt, oil, grease, rust, scale, and foreign matter. Clean with sandpaper, steel scraper, or wire brushes where necessary.
- C. Specified coats are to cover completed painting and finishing work. Where color, stain, or undercoats show through final coat, install additional coats until uniform coverage is obtained.
- D. Vary tints of undercoats slightly for identification of succeeding coats. Ample time of drying required to secure best possible results.
- E. Coats specified are in addition to shop or mill priming required under other Sections of these specifications.
- F. **All cabinet devices that require finish painting are to be painted with doors in the open position and shall be allowed to dry for a minimum of 24 hours in the open position. DO NOT PAINT DOORS CLOSED AND TRIM AFTER DRYING.**
 - 1. **Cabinets that require finish painting include, but are not limited to, wall and ceiling access doors, fire extinguisher/hose/valve cabinets, electrical panel boxes, etc.**

3.04 MOISTURE CONTROL

- A. Give back side of interior wood trim in contact with masonry units one application of water repellent preservative.

3.05 PAINT SCHEDULE

A. Finish surfaces as follows:

SURFACE	TREATMENT
1. Exterior Steel / Ferrous Metals:	<u>1st Coat</u> - SW Pro-Cryl® Universal Acrylic Primer B66W00310 Series (Touch up only on primed surfaces) <u>2nd & 3rd Coats</u> - SW B66W01151 - Pro Industrial DTM Acrylic Semi-Gloss.
2. Interior Ferrous Metals:	<u>1st Coat</u> - SW Pro-Cryl Universal Water Based Primer, B66-310 Series (Touch up only on primed surfaces) <u>2nd & 3rd Coats</u> - SW ProMar 200 Alkyd Eg-Shel B33 or S/G B34 as selected by Architect.
3. Interior Aluminum:	<u>1st Coat</u> - SW Pro-Cryl Universal Water Based Primer, B66-310 Series (Touch up only on primed surfaces) <u>2nd & 3rd Coats</u> - SW ProMar 200 Alkyd Eg-Shel B33 or S/G B34 as selected by Architect.
4. Exterior Aluminum:	<u>Primer</u> - SW B66W00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer. <u>2 Coats</u> - SW B66W00351 - Sher-Cryl HPA High Performance Acrylic Semi-Gloss Coating.
5. Galvanized Metals:	<u>1st Coat:</u> SW B66W00310 - Pro Industrial™ Pro-Cryl® Universal Acrylic Primer, Off White <u>2nd & 3rd Coats:</u> SW B66W01151 Pro Industrial DTM Acrylic Semi-Gloss Extra White.
6. Int. Gyp. Board - Painted:	<u>1st Coat</u> - SW PrepRite High Build Latex Wall Primer/Surfacer, B28W601 <u>2nd & 3rd Coats</u> - SW ProMar 200 Latex Eg-Shel B20-2200 or S/G B31-2200 Enamel as selected by Architect.
7. Int. Gyp. Board - Glazecoat:	SW Water Based Epoxy Resin, B70-200 Series with Gloss Hardener B60V15
8. Elastomeric Coating (Exterior CMU):	<u>Prime Coat</u> - Provide manufacturer's recommended primer, undercoat or block filler if required. Thorolastic 100% acrylic with 300% elongation by Sika
9. Slip Resistant Additive	H&C® SharkGrip™ for paint or stain - Follow manufacturer's recommendations.

3.06 PAINTING OF MECHANICAL AND ELECTRICAL WORK

- A. Painting of pipe and duct insulation and un-coated ferrous metal in inaccessible pipe and duct chases, in plumbing chases, and in spaces above ceiling is not required.
- B. Metal Work in Mechanical Room (finish as follows):
 - 1. Clean pre-finished equipment and touch up with enamel to match manufacturer's final coat.
 - 2. Clean exposed pipe, exposed conduit and electric outlet boxes, hangers and brackets, valve handles, and miscellaneous pipe line devices and give two coats of medium gray enamel.
 - 3. Clean prime painted or unfinished items of manufactured mechanical and electrical equipment, then prime and finish with two coats of enamel to match other finished items of equipment.
 - 4. Finish remaining exposed metal items with two coats of light grey enamel.
- C. Paint exposed interior metal work, including ferrous and non-ferrous piping, for heating ventilating, plumbing and electrical equipment, electric cabinets, ventilating grilles, metal access panels. Give exposed metal items one coat of enamel undercoater and one coat of enamel in addition to priming coat.
- D. Give pipe and duct insulation exposed to view one coat glue size and two coats enamel.
- E. **Paint all mechanical, electrical and plumbing items that are visible through registers, grilles and diffusers with Flat Black-Out paint.**

3.07 PROTECTION, CLEAN UP, AND TOUCH-UP

- A. Protect all work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint drops and smears from hardware, glass and other surfaces and items.
- C. Before final inspection, touch-up or refinish painted surfaces which have become damaged or discolored.
 - 1. Perform touch-up work in a manner to produce solid even color and finish texture to match surrounding color and finish texture.
 - 2. Areas that receive touch-up work and do not match surrounding color or finish texture will be refinished at Contractors expense.

END OF SECTION 09 91 00

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide UV cured elastomeric waterproofing wall coating system, on masonry, block, brick, concrete, stone, fiber cement material, plastic, metal, mastics, painted surfaces, plaster, or other approved substrate by manufacturer and shown on the drawings and described herein.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 - 1. Waterproofing Manufacturer must show evidence that the specified membrane has been manufactured by the same organization or direct affiliate.
 - 2. Waterproofing Manufacturer shall have available an in-house technical staff to assist the contractor, when necessary, in application of the products and final inspection of the assembly.
- B. In-Progress Inspection: During the application process, the coating membrane manufacturer or his representative shall inspect the work involved.
- C. Installer's Qualifications: The Contractor shall demonstrate qualifications to perform the work of this Section by submitting the following documentation:
 - 1. Certification or license by the waterproofing membrane manufacturer as an authorized applicator of the product the installer intends to use.
- D. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary waterproofing manufacturer.

- E. Final Inspection
 - 1. Manufacturer's representative shall provide a comprehensive final inspection after completion of the coating system. All application errors must be addressed and final punch list completed prior to the issuance of the warranty.
- F. Mockups: Prepare one mockup of coating system with chosen color to verify preliminary selections made under sample submittals.
 - 1. Architect will select exterior wall surface of at least ten square feet to represent surfaces and conditions for application of elastomeric coating.
 - 2. If Architect/Engineer determines mockup does not comply with requirements, modify mockup or construct new mockup until mockup is approved.
 - 3. Final approval of color selections will be based on approved mockup.
- G. Pre-Installation Meeting:
 - 1. Conduct meeting at Project site.
 - 2. Review requirements for waterproofing including:
 - a. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays
 - b. Site use, access, staging, and set-up location limitations
 - c. Surface preparation and substrate condition and pretreatment.
 - d. Installation procedures.
 - e. Special details.
 - f. Minimum curing period.
 - g. Testing and inspection requirements.
 - h. Site protection measures.
 - 3. Contractor's site foreman, waterproofing manufacturer's technical representative, waterproofing Installer, Owner's Agent, and Architect shall attend.

1.05 COMPLIANCE

- A. Work for this project shall be conducted in accordance with all applicable Local, State and Federal laws and regulations with the most restrictive law and regulations applying.
- B. Permits, inspections and appropriate certificates as required by work under this contract shall be obtained by and paid for by the Contractor.
- C. The Contractor shall comply with all ordinances regarding dust, debris and noise.
- D. The Contractor shall familiarize himself with all aspects of job conditions prior to submitting his bid for the project.
- E. The Contractor shall protect all adjacent surfaces, fixtures and equipment to prevent damage in any form.

- F. Any adjacent surface, coating system, fixture or equipment damaged in this sequence of work shall be repaired or replaced at no cost to the owner by the Contractor to its original condition.
- G. All waterproofing system components shall meet current VOC regulations as established by the State in which they are being installed; and stating total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, etc.).

1.06 TESTING

- A. Upon completion of the coating membrane work, the manufacturer's representative and the contractor will calculate the coverage rate and subsequent dry film thickness of the applied coating material to ensure that the minimal requirements of this technical specification have been met. If actual dry film thickness needs to be measured, then the dry film thickness may be measured with a Tooke Gage or cutting out of a physical sample and measurement under a graded reticule microscope.
- B. If minimum dry film thickness requirements have not been met by the contractor, then additional coating membrane material must be applied by the contractor at his cost to fulfill the specification requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original containers with seals unbroken, labeled with waterproofing manufacturer's name, product brand name and type, date of manufacture, lot number, and directions for storing and mixing with other components.
- B. Keep materials dry and do not allow materials to be exposed to moisture during transportation, storage, handling, and installation. Reject and remove from Site new materials which exhibit evidence of moisture during application, or have been exposed to moisture.
- C. Store materials in original, undamaged containers in clean, dry, protected location on raised platforms with weather-protective coverings, within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight. Waterproofing manufacturer's standard packaging and covering is not considered adequate weather protection. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.
- D. Store all materials at temperatures between 35°F and 86°F.
- E. Remove and replace materials that cannot be applied within stated shelf life.

1.07 PROJECT CONDITIONS

- A. All surfaces to be coated shall be clean, sound and properly prepared for the coating application.
- B. Verify existing dimensions and details prior to installation of materials. Notify Architect/Engineer of conditions found to be different than those indicated in Contract Documents. Architect/Engineer will review situation and inform Contractor and Installer of changes.
- C. Observe Owner's limitations and restrictions for site use and accessibility.
- D. Application of the coating membrane shall not commence nor proceed during conditions outside of the general ambient parameters for application (between 40°F and 95°F), or during pending inclement weather. Inclement weather must be anticipated such that the applied elastomeric membrane is adequately dried and cured to prevent wash-off in driving rain.
- E. All terminations for elastomeric waterproofing wall coating system shall be as per Architect/Engineer's drawings and details.
- F. Install materials in strict accordance with safety requirements required by waterproofing manufacturer, Material Safety Data Sheets, and local, state, and federal rules and regulations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following manufacturer:

Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071. Toll Free 800-933-SIKA (7452), www.sikausa.com
- B. Specifications and Drawings are based on manufacturer's proprietary literature from Sika. Other manufacturers shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.02 MATERIALS

- A. High-build, water-based, elastomeric, 100 percent acrylic, waterproof coating.
 - 1. Acceptable Product: Sika Thorolastic® - 750.
- B. Thorolastic® - 750 Fine:
 - 1. Density, ASTM D1475: 10.2 to 11.2 lbs per gal.

2. Solids Content, ASTM D5201:
 - a. By Weight: 65.5 percent.
 - b. By Volume: 56 percent.
 3. Viscosity, ASTM D562: 127 to 135 KU.
 4. VOC Content, ASTM D3960: 0.32 to 0.42 lbs per gal, less water and exempt solvents.
- C. Performance Requirements: Thorolastic® - 750, applied at 16 mils DFT:
1. Ultimate Elongation, ASTM D412: 344 percent.
 2. Elongation Recovery, ASTM D412:
 - a. After 10 Minutes: 96.9 percent.
 - b. After 24 Hours: 98.4 percent.
 3. Ultimate Tensile Strength, ASTM D412: 220 psi.
 4. Crack Bridging, PR EN 1062-7:
 - a. At minus 77 degrees F: 12 mils.
 - b. At 32 degrees F: 19.5 mils.
 - c. At 73 degrees F: 27.5 mils.
 5. Flexibility, ASTM D522, at minus 30 degrees F: 1/8 inch mandrel.
 6. Pull-Off Strength Adhesion, ASTM D4541: 210 psi.
 7. Wind-Driven Rain, Federal Specification TT-C-555B: Passes.
 8. Water-Vapor Permeance, ASTM D1653: 10 perms.
 9. Carbon-Dioxide Diffusion, PR EN 1062-6:
 - a. R (equivalent air-layer thickness): 263 feet.
 - b. Sc (equivalent concrete thickness): 8 inches.
 10. Accelerated Weathering, ASTM G23, Type D, 5,000 hours: Passes.
 11. Visual Color Change, ASTM D1729, 5,000 hours: Passes.
 12. Chalking, ASTM D4214, 5,000 hours: Passes.
 13. Freeze/Thaw Resistance, ASTM C67, 60 cycles: Passes.
 14. Salt-Spray Resistance, ASTM B117, 300 hours: Passes.
 15. Dirt Pick-Up, ASTM D3719, after 6 months exposure: 94.33 percent.
 16. Mildew Resistance, ASTM D3273 and 3274: No growth.
- F. Approximate Coverage Rate: 50 to 100 sq ft per gal.
- G. Wet Film Thickness (WFT):
1. Fine: 16 to 32 mils.
- H. Dry Film Thickness (DFT):
1. Fine: 9 to 18 mils..
- I. Color: As selected by the architect.
- J. Texture:
1. Fine.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Protection: Protect adjacent Work areas and finish surfaces from damage during coating application.
- B. Prepare surfaces in accordance with manufacturer's instructions.
- C. Ensure that substrate is sound, clean, dry, and free of dust, dirt, oils, grease, laitance, efflorescence, mildew, fungus, biological residues, and other contaminants that could prevent proper adhesion.
- D. Clean surface to achieve texture similar to medium-grit sandpaper.
- E. Repair holes and spalled and damaged concrete with repair materials approved by coating manufacturer.
- F. Remove protruding concrete accessories and smooth out irregularities.
- G. When chemical cleaners are used, neutralize compounds and fully rinse surface with clean water. Allow surface to dry before proceeding.
- H. Remove blisters or delaminated areas and sand edges to smooth rough areas and provide transition to existing paint areas.
- I. Check adhesion of existing paint in accordance with ASTM D3359, measuring adhesion by Tape Method A.
- J. Concrete Surfaces:
 - 1. Cure concrete a minimum of 28 days before application.
 - 2. Remove laitance, bond-inhibiting contaminants, form-release agents, and sealers.
 - 3. Remove form tie wires and repair holes, small voids, and spalls using appropriate repair product approved by coating manufacturer.
 - 4. Abrasive-blast slick, dense concrete surfaces or use primer approved by coating manufacturer. Test surface for proper adhesion.
- K. Brick and Concrete Masonry Unit (CMU) Surfaces:
 - 1. Ensure CMUs are laid true and fully cured to full load-bearing capacity.
 - 2. Remove mortar splatter and excess mortar.
 - 3. Repoint or fill voids with appropriate patching product approved by coating manufacturer.
 - 4. Ensure mortar joints are sound and free of voids and cracks.
 - 5. Apply base coat approved by coating manufacturer to new CMUs.
- L. Plaster and Stucco Surfaces:
 - 1. Clean surfaces and remove debonded or delaminated plaster or stucco.

2. Repair with material approved by coating manufacturer.
 3. Allow new plaster or stucco to cure minimum of 14 days at 70 degrees F (21 degrees C) and 50 percent relative humidity or until pH level has reached 10. Allow longer cure times if temperatures are lower or relative humidity is higher.
 4. Prime chalky surfaces with primer approved by coating manufacturer after cleaning and profiling. Allow primer to dry.
- M. Exterior Insulation and Finish System (EIFS) Surfaces:
1. Refasten or re-adhere delaminated or loose expanded polystyrene (EPS) insulation in accordance with manufacturer's approved methods.
 2. Replace or patch missing or damaged EPS to original condition.
 3. Finish with trowel acrylic finish to match and blend with existing texture.
 4. Allow repaired areas to fully cure.
 5. Refer to EIFS manufacturer's instructions for appropriate repair and procedures.
- N. Existing Acrylic Coating Surfaces:
1. Sand or grind edges of existing coating to ensure adhesion and smooth transition of new material. Sand edges of area to feather-edge.
 2. Wash down and allow to completely dry.
 3. Prime chalky surfaces with primer approved by coating manufacturer.
- O. Crack Preparation and Pretreatment:
1. Treat cracks larger than 1/32 inch and up to 1/16 inch with brush-grade acrylic crack filler approved by coating manufacturer.
 2. Treat cracks larger than 1/16 by 1/16 inch but less than 1/4 by 1/4 inch with knife-grade acrylic crack filler approved by coating manufacturer.
 3. Treat moving cracks larger than 1/4 by 1/4 inch with internally plasticized polyurethane sealant approved by coating manufacturer.
 4. Apply test application of crack repair materials in inconspicuous location to ensure compatibility and aesthetic approval.

3.02 MIXING

- A. Mix coating in accordance with manufacturer's instructions to ensure uniform color and aggregate disbursement and to minimize air entrapment.
- B. In multi-pail applications, mix contents of each new pail into partially used pail to ensure color consistency and smooth transitions from pail to pail.

3.03 APPLICATION

- A. Apply coating in accordance with manufacturer's instructions.
- B. Apply coating as a 2-coat system.

- C. Maintain proper uniform wet-film thickness during application to ensure performance characteristics desired.
- D. Apply coating to achieve pinhole-free, consistent film build on coated surfaces.

3.04 PROTECTION

- A. Protect applied coating from damage during construction.

END OF SECTION 09 96 53

PART 1 - GENERAL**1.01 SUMMARY**

- A. General: Provide all labor, materials, equipment, tools and services, necessary to complete the fabrication and installation of the Work, as indicated by the Drawings.
- B. Coordination: Assign a Project Manager prior to beginning Work for coordination with the Owner for complete understanding and execution of the project requirements throughout the entire project. This includes, but is not limited to project meetings, submission review, fabrication and installation.
- C. Provide 911 address signage on outside of building as required by local municipality and NFPA:
 - 1. NFPA 1 Fire Code 2018: New and existing buildings shall have approved address numbers placed in a position to be plainly legible and visible from the street or road fronting the property. Address numbers shall be a minimum of 4 inches (100 mm) high with a minimum stroke width of 1/2 inches (13 mm).

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Shop Drawings: List sign styles, lettering, materials, thicknesses, locations and dimensions of each interior sign.
- D. Selection Samples: One complete set of color chips representing manufacturer's full range of available colors.
- E. Verification Samples: Two full size samples representing each type, style, material, thickness, and color specified, including method of attachment.

1.04 QUALITY ASSURANCE

- A. Use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, and thoroughly familiar with requirements of this work.
- B. Regulatory Requirements: Comply with requirements of ICC/ANSI A117.1 and ADAAG.

1.05 PRODUCT HANDLING

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

PART 2 - PRODUCTS

2.01 BUILDING SIGNAGE

- A. Contractor to allow the sum as stipulated in Section 01 21 00 - Allowances, in the Base Bid for purchase, taxes, delivery to site and installation of all exterior and interior building signage to be selected by Architect. Allow minimum 6-8 weeks for production and installation of typical identification signage prior to local Certificate of Occupancy.
- B. All signage to be purchased under the stated allowance will comply with the 2017 ICC ANSI A117.1 Accessible and Usable Buildings and Facilities ADA Standards for size, location, color, type face and braille.
- C. Allowance does not include building plaque specified below.
- D. Allowance shall include building address numbers as may be required by local municipality. Minimum 4" high premium vinyl decals on pre-spaced sheet in color and font as selected by architect, or as otherwise indicated on the drawings. Coordinate location with local Authority Having Jurisdiction.

2.02 BUILDING PLAQUE

- A. Provide one cast bronze metal 18" x 24" building plaque installed with concealed mounting, where directed.
- B. Letter Style: Standard fonts conforming to copy supplied by Architect.
- C. Furnish single line border edges and polished letters on background similar to light pebble.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examination - On Site
 - 1. Examine areas with Signage Contractor and Owner present, for compliance with requirements for installation and other conditions, which will adversely affect execution, permanence and quality of work. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to the Owner have been made.
 - 2. Examine signage for defects prior to installation. Do not install damaged signage.

3.02 INSTALLATION - SURFACE MOUNTED SIGNS

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with Manufacturer's written instructions.
- B. Install signs level, plumb and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
- C. Wall-Mounted Signs: Comply with Manufacturer's written instructions except where more stringent requirements apply. Use mounting methods indicated.
 - 1. Mount with 3M VHB acrylic foam tape.
 - 2. Mount with screws.
 - 3. Mount with silicone and 3M VHB acrylic foam tape.
- D. Mechanical Fasteners: Where indicated, use nonremovable mechanical fasteners placed through pre-drilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by Manufacturer.

3.04 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to Manufacturer's written instructions. Protect signs from damage until acceptance by Agency.

END OF SECTION 10 14 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install metal accessories called for in Toilet Accessory Schedule.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Samples: Submit a sample of each component illustrating color and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 REFERENCES

- A. 2021 Arkansas Fire Prevention Code (IBC 2021), Chapter 11 - Accessibility.
- B. BABIES Act, or Bathrooms Accessible In Every Situation Act (2016) requiring changing tables in all publicly accessible federal buildings as determined by the GSA.
- C. 2017 ICC A117.1 - Accessible and Usable Buildings and Facilities.
- D. 2010 ADA Standards for Accessible Design.
- E. ADA Accessibility Guidelines for Buildings and Facilities, July 23, 2004 – Provisions for Children.
- F. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM A167-99 (Re-approved 2004) - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

- H. ASTM A269/A269M-2015 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- I. ASTM A794/A794M-2018 - Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled.
- J. ASTM B456-2003 - Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.05 QUALITY ASSURANCE

- A. Use personnel skilled in work required, completely familiar with manufacturers' recommended methods of installation, and thoroughly familiar with requirements of this work.

1.06 PRODUCT HANDLING

- A. Protection: Protect toilet and bath accessories before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

PART 2 - PRODUCTS

2.01 METAL TOILET ACCESSORIES

- A. Manufacturers and Accessory Numbers are listed in Toilet Accessory Schedule. Manufacturers who may furnish products for review by Architect are:
 - 1. American Specialties (ASI)
 - 2. Bobrick
 - 3. Bradley Corporation
 - 4. comfortdesigns
 - 5. Delta Faucet
 - 6. McKinney
 - 7. Metpar
 - 8. Approved Equal

2.02 MATERIALS

- A. Stainless Steel: AISI Type 302/304, with "Brushed" finish, 0.034-inch (22-gage) minimum thickness.
- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527, G60.
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

2.03 FASTENERS

- A. Provide screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.04 PLUMBING PIPE WRAP

- A. At all exposed lavatory piping, provide TRUEBRO Lav Guard® 2, Fast Fit Undersink Piping Covers as manufactured by IPS Corporation, 202 Industrial Park Lane, Collierville, TN 38017, 800-340-5969 or approved equal.
 - 1. Use at all sinks or lavatories that do not have removable apron.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Coordinate with other trades to ensure proper and adequate provision in framing and wall finish for installation of selected accessories.
- B. Prior to installation, inspect location of accessories and verify that necessary provisions have been made. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' recommendations, anchoring components firmly in place.

END OF SECTION 10 28 13

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Firefighting devices consist of hand-portable fire extinguishers and metal cabinets, and accessories.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers
- B. ADA Accessibility Guidelines
- C. IBC/IFC Tables 906.3(1) and 906.3(2) for determining extinguisher rating, fire classification, hazard classification, and travel distance.
- D. UBC Standard 7-5 (ASTM E-814-83) - Fire-rated cabinet option for combustible and non-combustible walls.

1.05 QUALITY ASSURANCE

- A. Provide fire extinguishers, cabinets, and accessories by a single manufacturer.

1.06 PRODUCT HANDLING

- A. Protection: Protect firefighting devices before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements necessary at Contractor's expense.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
1. **Basis of Design:** Larsen's Manufacturing Co., 7421 Commerce Ln NE, Minneapolis, MN 55432, (763) 571-1181 or (800)527-7367.
 2. Potter Roemer, 17451 Hurley St, City of Industry, CA 91744 Phone: (800) 366-3473 E-mail: info@potterroemer.com
 3. JL Industries, Activar Construction Products Group, 800-554-6077. Email: sales@activarcpg.com
- B. Abbreviations:
- | | |
|-------|---|
| FRC-1 | Fully Recessed Cabinet |
| WHE-1 | Wall Hung Extinguisher (with clip or bracket) |
| FEB-1 | Fire Extinguisher Bracket |

2.02 FIRE EXTINGUISHERS

- A. **Type 1:** Provide multi-purpose dry chemical type, Model MP-10 with UL Rating 4A-80B:C for Class A, B and C fires manufactured by Larsen's®, or approved equal.
1. Provide WHE-1 at Shop, to include FEB-1 Standard Bracket No. 546.

2.03 FIRE EXTINGUISHER CABINETS

- A. **FRC-1:** Construct cabinets from 18 gauge, or heavier, stainless steel with #4 stainless steel finish. Provide Larsen's®, Occult Series, No. SS-O2409 or approved equal, with Vertical Duo Clear Acrylic Door. Mount at 56" to top of housing in masonry wall construction, maintaining consistent height at all wall types. Neither the extinguisher handle nor the cabinet handle can be mounted higher than 48" AFF, per ADA.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Coordination: Coordinate with other trades to ensure proper and adequate provision in framing and wall covering for installation of recessed cabinets.
- B. Inspection:
1. Prior to installation, inspect cabinet recesses, and verify that necessary provisions have been made.
 2. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

3.02 INSTALLATION

- A. Install the items of this Section in strict accordance with the original design, approved shop drawings, and requirements of agencies having jurisdiction, as approved by the Architect, anchoring all components firmly into position.

3.03 SERVICE

- A. Determine approximate completion date of Work. Inspect, charge, and tag fire extinguishers at date not more than ten days before or less than one day before actual completion date of the Work.

END OF SECTION 10 44 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide other miscellaneous specialties specified.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Furnish at least one person, present at all times, thoroughly familiar with installation requirements of each item, to personally supervise installation.

1.05 PRODUCT HANDLING

- A. Protection: Protect miscellaneous specialty items before, during, and after installation. Protect installed work and materials of other trades.
- B. Replacements: In event of damage, immediately make repairs and replacements at Contractor's expense.

PART 2 - PRODUCTS

2.01 RAPID ENTRY SYSTEM

- A. Provide Knox-Box® emergency entry key box by Knox Co., 949-252-8181 or approved equal. Provide Model #3270 Recess Mount in Black color and #3290 Hinged Door Recessed Mounting Kit. Contractor to contact local fire department to apply for authorization to order box and verify location. Orders are not accepted without authorized signature of local fire official. Recommended mounting height is 72" to top of box to help deter vandalism. Verify with local Authority Having Jurisdiction (AHJ).

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to installation, verify items may be installed in accordance with manufacturers' recommendations.
- B. Notify Architect of conditions that would adversely affect installation.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install miscellaneous specialties in strict accordance with manufacturers' current recommendations and instructions.

3.03 ADJUSTMENT AND CLEANING

- A. Verify that trim is in place and adjust components.
- B. Remove labels from equipment and remove packing materials from job site.

END OF SECTION 10 80 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install manual disappearing stairways.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with 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 for Stairs:
1. Plan and section of stair installation.
 2. Indicate rough opening dimensions for ceiling and/or roof openings.
- D. Shop Drawings for Ladders:
1. Plan and section of ladder installation.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square representing actual product, color, and patterns.
- F. Substitutions will not be considered prior to the award of the General Contract.

1.04 RELATED SECTIONS

- A. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing.
- B. Section 06 10 00 - Rough Carpentry.

1.05 REFERENCES

- A. ANSI A14.3: Ladders - Fixed - Safety Requirements.

- B. ANSI A14.9: Safety Requirements for Ceiling Mounted Disappearing Climbing Systems.
- C. OSHA 1910.23: Ladders.
- D. OSHA 1910.25: Stairways.
- E. OSHA 1910.28: Duty to have fall protection and falling object protection.
- F. OSHA 1910.29: Fall protection systems and falling object protection-criteria and practices.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.
 - 3. Rebuild mock-up area as required to produce acceptable work.

1.07 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Store products in manufacturer's unopened packaging until ready for installation. Store stairway until installation inside under cover. If stored outside, under a tarp or suitable cover.
- C. Handle materials to avoid damage.

1.09 PROJECT CONDITIONS

- A. Maintain environmental conditions including temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

- A. Limited Warranty: Provide manufacturer's standard limited five year warranty against defective material and workmanship, covering parts only, no labor or freight. Defective parts, if deemed so by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Precision Ladders, LLC, which is located at: P. O. Box 2279; Morristown, TN 37816-2279; Toll Free Tel: 800-225-7814; Tel: 423-586-2265; Web: www.PrecisionLadders.com

2.02 MANUAL DISAPPEARING STAIRWAY

- A. Manual Disappearing Stairway: Product: Super Simplex Disappearing Stairway as manufactured by Precision Ladders LLC
 - 1. Model 1000: Stairs for Ceiling Heights 7 feet-0 inch - 12 feet-0 inch:
 - 2. Model 2000: Stairs for Ceiling Heights 12 feet-1 inch - 13 feet-6 inches:
- B. Performance Standard: Unit shall comply with ANSI A14.9, Residential Type for rough openings between 22-1/2 inches to 27 inches. Stairway capacity shall be rated at 500 lb.
- C. Components:
 - 1. Ceiling Opening:
 - a. Ceiling heights from 9 feet 10 inches - 12 feet 0 inch require opening of 30 inches X 64 inches.
 - b. Ceiling heights from 12 feet 1 inch - 13 feet 6 inches require opening of 22-1/2 inches X 72 inches.
 - 2. Stairway Stringer: 6005-T5 Extruded aluminum channel 5 inches X 1 inch X 1/8 inch tri-fold design; steel blade type hinges; adjustable feet with plastic Mar-guard. Pitch shall be 63 degree.
 - 3. Stairway Tread: 6005-T5 extruded aluminum channel 5-3/16 inches X 1-1/4 inches X 1/8 inch. Depth is 5-3/16 inches. Deeply serrated top surface. Riser Height: 9-1/2 inches. Clear Tread Width for Standard Width: 18 inches.
 - 4. Railing: Aluminum bar handrail riveted to stringers, upper section only.
 - 5. Frame:
 - a. When ceiling to floor or roof deck above is under 12 inches frame shall be 1/8 inch steel formed channel, box.

- b. When ceiling to floor or roof deck above is 12 inches or greater, the frame shall be 1/8 inch steel, 63 degree (with built-in steps) on the hinge end, 90 degree on the other end, custom depth to fill distance from ceiling to floor above. The custom frame shall require a longer opening in the floor above than shall be required at the ceiling level.
- 6. Door Panel:
 - a. Standard, non-fire rated, door shall be constructed of 1/8 inch aluminum sheet attached to stairway frame with a steel piano hinge. Door overlaps bottom flange of frame. Eye bolt accommodates pole for opening and closing door.
- 7. Hardware:
 - a. Steel blade type hinge connecting stringer sections. Zinc plated and chromate sealed.
 - b. Steel operating arms, both sides. Zinc coat with clear trivalent chromate.
 - c. Double acting steel springs and cable, both sides.
 - d. Rivets rated at 1100 lb shear strength each.
 - e. Steel section alignment clips at stringer section joints.
 - f. Molded rubber guards at corners of aluminum door panel.
- 8. Finish: Mill finish on aluminum stairway components. Prime coat on frame.

2.03 FABRICATION

- A. Completely fabricate stairway ready for installation before shipment to the site.
- B. Completely fabricate handrail components ready for field assembly to ladder before shipment to site.

2.04 FINISHES

- A. Mill finish on aluminum components is standard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved submittals. Install in proper relationship with adjacent construction.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 FIELD QUALITY CONTROL

- A. The manufacturer has representatives in all areas of the United States. For the name of the closest representative, call (800) 225-7814.

END OF SECTION 11 33 00

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PART 1 - GENERAL

1.01 SUMMARY

- A. Provide manually-operated roll-up fabric interior window shades, including mounting and operating hardware.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.
- D. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section. If manufacturer does not meet minimum experience requirement, please submit life cycle test data showing minimum 2000 complete operational cycles for each year of warranty showing no failure and that shade remains fit for use as a operable shade. **All components and materials shall be manufactured in the USA.**

- B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use. Show complete manufacturer data (name, location, contact) and certification from manufacturer that the fabrics sourced for this project comply with the test data provided.
- C. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window(s) designated by Architect.
 - 2. Do not proceed with remaining work until mock-up is accepted by Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.
- D. Store products in manufacturer's unopened packaging until ready for installation.

1.06 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.07 PROJECT CONDITIONS

- A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

1.08 WARRANTY

- A. Manufacturer to warrant its hardware components and shade fabric to be free from defects in material and workmanship under the normal and proper use for a period of twenty-five (25) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Draper, Inc.. Toll Free Tel: 800-238-7999.
- B. All work regarding shades to be coordinated with Kavanaugh Blind Shade & Shutter Co., 5208 Kavanaugh Blvd, Little Rock, AR; mobile: (501) 412-6866
email: Brett Todd sbrettodd@outlook.com
- C. Approved Dealers:
 - 1. Shop Mr. Blinds, Searcy, AR; Tel.: (501) 232-8382, Mandy Lloyd.
 - 2. Baker Window Coverings; Tel.: (501) 529-2900, Janet Baker
 - 3. Other equal dealers will be subject to approval by the architect.
- D. Approved equal manufacturers:
 - 1. Hunter Douglas
 - 2. SWF Contract (Springs Window Fashions)

2.02 MANUALLY OPERATED WINDOW SHADES

- A. Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation.
 - 1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
 - a. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon. White or Black color as selected by Architect.
 - b. Bead chain loop: Stainless steel bead chain hanging at side of window.
 - c. Idler Assembly: Provide roller idler assembly of molded nylon with adjustable or spring-loaded length idler pin to facilitate easy installation, and removal of shade for service.
 - d. Bead Chain Hold Down: P-Clip (standard).
 - 2. Mounting:
 - a. Mounting brackets.
 - b. End-caps and fascia.
 - 3. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
 - 4. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.
 - a. Endcap covers: To match fascia or headbox color.

5. Brackets: Plated stamped steel. Provide size compatible with roller size.
 - a. Mounted to jamb.
6. Shade slat: Slat encased in heat seamed hem.
7. Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
 - a. Attachment: Snaps onto end-caps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. No notching is required.
 - b. Shape: Square Fascia Panel.
 - c. Finish: Bronze powder coat.

2.03 FABRIC

- A. Light-Filtering Fabrics
 1. Refer to the Product Schedule located in the drawings for locations, types, patterns and colors.
 - a. Openness Factor: 3%
 - b. Color: Charcoal (Verify)

PART 3- EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.
- B. Coordinate requirements for blocking, construction of shade pockets, and structural supports to ensure adequate means for installation of window shades.
- C. Coordinate installation of recessed shade pockets with construction of suspended gypsum board ceilings specified in Section 09 21 16.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install roller shades level, plumb, square, and true. Allow proper clearances for window operation hardware.

- C. Shade pockets (if applicable):
 - 1. Install shade pockets prior to installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches minimum centers.
 - 2. Install shade pockets in conjunction with installation of suspended ceiling system. Attach to supporting structure with screws through top of pocket at 24 inches minimum centers.
 - 3. Install corner pieces securely and in alignment with pockets.
 - 4. Install pocket ends securely and in alignment with pockets.
 - 5. After interior construction is essentially complete, install shade and operating mechanism in pocket.
- D. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
 - 1. Fascias.
 - 2. Closure panels.
 - 3. Endcaps.
- E. Install headbox, side channels, and sill channel with sealant specified in Section 07 92 00 - Joint Protection.
- F. Position shades level, plumb, and at proper height relative to adjacent construction. Secure with fasteners recommended by manufacturer.

3.04 TESTING AND DEMONSTRATION

- A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
- B. During daylight hours, lower shades and turn off interior lights. Verify that there are no light leaks at perimeter or within shade assembly. Correct deficiencies.
- C. Demonstrate operation of shades to Owner's designated representatives.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 SCHEDULES

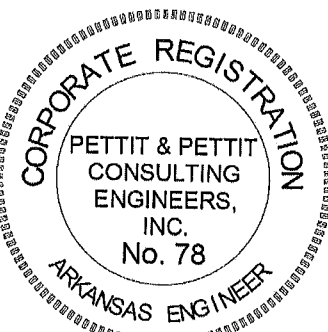
- A. Refer to Drawings for shade types and locations.

END OF SECTION 12 24 13

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The Engineer of Record for Divisions 22 and 23 of the Specifications for the Regional Field Office Renovations Project, Arkansas Game and Fish Commission, Jonesboro, Arkansas (P&P Job No. 25-142) is:

7/30/26
Date



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PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for complete plumbing system.

1.02 RELATED SECTIONS

- A. Section 22 10 05 – Plumbing Piping.

1.03 SITE INSPECTION

- A. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.04 DRAWINGS

- A. Mechanical drawings show general arrangement of piping ductwork, equipment, etc. Follow closely as actual building construction and work of other trades will permit.
- B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.
- C. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories required to meet the conditions.
- D. Record difference between mechanical work as installed and as shown in Contract Documents on a set of prints of mechanical drawings to be furnished by Architect. Return these prints to Architect at completion of project. These will be labeled "Contractor Revised Drawings".

1.05 SUBSTITUTIONS

- A. The naming of specified items on the drawings or in the specifications is intended to establish a level of quality and performance. Substitution requests may be submitted at the time of shop drawing submittal. Review of substituted equipment or material prior to the Bid Date will not be considered unless otherwise specified.
- B. Substitution shall be submitted as specified in Division 01.

1.06 CODE REQUIREMENTS, FEES & PERMITS

- A. Perform work in accordance with applicable provisions of state and local Plumbing Code, gas ordinances and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations and ordinances.
- B. In case of differences between building codes, state laws, local ordinances, utility company regulations and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.

1.07 CONTRACTOR REVISED DRAWINGS

- A. The contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.
- B. Exact location of all underground utility service entrances and their connections to utility mains, well heads, loop piping and all valves, etc., which will be concealed in the finished work shall be accurately indicated on the drawings by measured distances.
- C. Upon completion of the work and prior to final payment, the contractor shall furnish to the Architect, one set of "contractor revised" prints, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.
- D. Contractor shall include all addendum items and field change order information on the revised drawings. Revise all schedules shown on the drawings to reflect the actual model numbers, capacities and electrical characteristics of substituted equipment.

1.08 COORDINATION OF WORK

- A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to Architect. Should conditions arise where certain changes would be advisable, secure Architect's approval of these changes before proceeding with work.
- B. Coordinate work of various trades in installing inter-related work. Before installation of mechanical items, make proper provisions to avoid interferences in a manner approved by Architect. Changes required in work specified in Division 22 caused by neglect to do so shall be made at no cost to Owner.
- C. Provide inserts and supports required by Division 22 unless otherwise noted. Furnish sleeves, inserts, supports and equipment that are an integral part of other divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are

properly installed. Expense resulting from improper location of installation of items above shall be borne by Division 22.

- D. Be responsible for required digging, cutting and patching incident to work of this Division and make required repairs afterward to satisfaction of Architect. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns or trusses.
 - 1. Each Section of this Division shall bear expense of cutting, patching, repairing and replacing of work of other Sections required because of its fault, error, tardiness or because of damage done by it.
 - 2. Cutting, patching, repairing and replacing pavements, sidewalks, roads and curbs to permit installation of work of this Division is responsibility of Section installing work.
- E. Adjust locations of pipes, etc. to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
 - 1. Make offsets, transitions, and changes in direction of pipes, as required to maintain proper headroom and pitch of sloping lines whether or not indicated on Drawings.
- F. Slots and openings through floors, walls, ceilings and roofs shall be provided by other Divisions in their respective materials. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.09 GENERAL PIPING INSTALLATION

- A. Furnish and install a complete system of piping. The piping drawings are diagrammatic and indicate the general location and connections. If the size of any piping is not clearly evident, obtain instructions from the Architect before proceeding with the work. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the contractor from responsibility for the proper erection of systems of piping in every respect suitable for the work intended. Piping systems that are not to be installed complete shall be so noted.
- B. Erection: Piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing. Remove all burrs and cutting slag by reaming or other cleaning methods. Changes in direction shall be made with fittings, except that bendings of pipe will be permitted, providing a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformation will not be acceptable. Piping shall be arranged so as not to interfere with removal of other equipment or devices nor to block access manholes or other access openings. Piping shall be installed to ensure noiseless circulation.
- C. Protection: Open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the system. Plugs or rags, wood, cotton, concrete, waste or similar materials must not be used in plugging.

- D. Cleaning and Flushing: Contractor shall take every precaution to remove dirt, grease, and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be flushed with clean water except where specified otherwise.
- E. Pipe Sizes: If the size of any piping is not clearly evident in the drawings, the contractor shall request instructions from the Architect as to the proper sizing. Any changes resulting from the contractor's failure to request clarification shall be at his expense.

1.10 THERMAL AND MOISTURE PROTECTION

- A. Install flashing, counterflashing and caulk or seal all penetrations in exterior walls or floors as required to prevent exterior moisture from entering building.

1.11 EQUIPMENT AND MATERIALS

- A. Product Approvals:
 - 1. If approval is received to use other than specified items, responsibility for specified capacities and ensuring that items to be furnished will fit space available lies with this Division.
 - 2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in specification.
- B. Use domestic made pipe, pipe-fittings and motors on project.
- C. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connection and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.
- D. Follow Manufacturer's directions in delivery, storage, protection and installation of equipment and materials.
 - 1. Promptly notify Architect in writing of conflicts between requirements of Contract Documents and manufacturer's directions and obtain Architect's written instructions before proceeding with work. Bear expenses arising from correcting deficiencies of work that do not comply with Manufacturer's directions or such written instructions from Architect.
- E. Deliver equipment and material to site and tightly cover to protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.12 REVIEW OF MATERIALS AND EQUIPMENT

- A. Furnish complete catalog data for manufactured items of equipment to be used in Work to Architect for review within 30 days after award of Contract.

- B. Submit six (6) copies of data in 3-ring binders with tab indices in same order and name as they appear in specification.
 - 1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions and other pertinent information. Pertinent information shall include as a minimum those items as scheduled on the drawings. Arrange submittal information to reflect these categories scheduled on the drawings.
 - 2. Provide an index of tab numbers at the front of each binder. List the specification number and category included under each tab as described in the specifications and as scheduled on the drawings.
 - 3. Provide cover sheet for each tab section. List each piece of equipment by name, model number and supplier.
 - 4. Underline applicable data and indicate model being supplied on each submittal sheet.
- C. If data is not submitted as specified or submittal is not complete, it will be returned without review.
- D. Catalog data or shop drawings for equipment which are noted as being reviewed by the Architect, shall not supersede Contract Documents.
- E. Review comments of Architect shall not relieve this Division from responsibility for deviations from Contract Documents unless Architects' attention has been called to such deviations in writing at the time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- F. Check work described in catalog data with Contract Documents for deviations and errors.

1.13 GUARANTEE

- A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or in the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.
- B. The Contractor shall, after completion of the original test of the installation, and acceptance of the Architect, provide any service incidental to the proper performance of the mechanical systems under guarantees outlined above for a period of one (1) year.

1.14 FINALLY

- A. It is the intention that this specification shall provide a complete installation except as hereinbefore specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included.
- B. 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.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 22 05 00

COMMON ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. This section specifies the basic requirements for electrical components which are an integral part of packaged PLUMBING equipment. These components include, but are not limited to factory installed motors furnished as an integral part of plumbing equipment.
- B. This section specifies the basic requirements for electrical components required to be furnished under Division 22, which are to be turned over to and installed by Division 26. These components include but are not limited to motors.
- C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for plumbing equipment are scheduled on the drawings.

1.02 RELATED SECTIONS

- A. Section 22 30 00 – Plumbing Equipment.

1.03 REFERENCES

- A. NEMA Standards MG-1: Motors and Generators.
- B. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.
- C. NEMA Standard 250: Enclosures for Electrical Equipment.
- D. NEMA Standard KS 1: Enclosed Switches.
- E. Comply with National Electrical Code (NFPA 70).
- F. Compliance and Labeling: Provide motors and starters which have been listed and labeled by a nationally recognized testing facility engaged in and equipped to test electrical equipment and materials.

1.04 SUBMITTALS

- A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

- A. Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.01 MOTORS

- A. The following are basic requirements for simple or common motors, for special motors, more detailed and specific requirements are specified in the individual equipment specifications.
1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
 2. Motor sizes shall be large enough so that driven load will not requirement the motor to operate in the service factor range.
 3. 2-speed motors shall be 2 separate windings on polyphase motors.
 4. Temperature Rating: Rated for 40 deg. environment, with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).
 5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly timed spaced starts per hour for manually controlled motors.
 6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
- B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
1. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
 2. Bearings:
 - a. Ball or roller bearings with inner and outer shaft seals;
 - b. Regreasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
 - c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
 - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
 3. Enclosure Type:
 - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
 - c. Weather protected Type I for outdoor use, Type II where not housed;
 4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
 5. Noise Rating: "Quiet" rating on motors located in occupied spaces of

building.

6. Efficiency: Provide "Energy Efficient" motors with a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a minimum efficiency as listed below.

1HP	80% Effy	10HP	87%
1-1/2 to 2HP	82%	15HP	89%
3HP	83%	20HP	90%
5HP	84%	25HP and up	91%
7-1/2 HP	85%		

- C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

Baldor Electric Co.
Century Electric, Inc.
General Electric Co.
Marathon Electric Mfg. Co.
Reliance Electric Co.
Westinghouse Electric Corp.

- D. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 22 05 13

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Extent of meters and gauges required by this section is indicated on drawings and/or specified in other Division-22 sections.
- B. Types of meters and gauges specified in this section include the following:
 - 1. Temperature Gauges and Fittings:
 - Glass Thermometers.
 - Dial Type Insertion Thermometers.
 - Thermometer Wells.
 - Temperature Gauge Connector Plugs.
 - 2. Pressure Gauges and Fittings:
 - Pressure Gauges.
 - Pressure Gauge Cocks.
 - Pressure Gauge Connector Plugs.
- C. Meters and gauges furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division-22 sections.

1.02 RELATED SECTIONS

- A. Section 22 10 05 – Plumbing Piping.
- B. Section 22 30 00 – Plumbing Equipment.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of meters, gauges, and fittings, or types and sizes required.
- B. UL Compliance: Comply with applicable UL standards pertaining to meters and gauges.
- C. ANSI and ISA Compliances: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.04 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of meter, gauge and fitting. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter, gauge and fitting schedule showing manufacturer's figure number, scale range, location, and accessories for each meter, gauge and fitting.

- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter and gauge. Include this data in maintenance manual.

PART 2 - PRODUCTS

2.01 TEMPERATURE GAGES

- A. Glass Thermometers:
1. General: Provide glass thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
 2. Case: Die cast aluminum, finished in baked epoxy enamel, clear acrylic plastic front, spring secure, 9 inches long.
 3. Adjustable Joint: Die cast aluminum, finished to match case, 180 degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.
 4. Tube and Capillary: Mercury filled, magnifying lens, 1 percent scale range accuracy, shock mounted.
 5. Scale: Satin faced, non-reflective aluminum permanently etched markings.
 6. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.
 7. Range: Conform to the following:
 - a. Hot Water: 30 degrees - 240 degrees F with 2 degree F scale divisions (0 degrees - 160 degrees Celsius) with 1 degree Celsius scale divisions.
 - b. Chilled Water: 30 degrees - 180 degrees F with 2 degrees F scale divisions (0 degrees-100 degrees Celsius) with 1 degree Celsius scale divisions.
 8. Available Manufacturers: Subject to compliance with requirements, manufacturers offering glass thermometers which may be incorporated in the work include, but are not limited to, the following:
Marshalltown Instruments, an Eltra Co.
Terice (H.O.) Co.
Weiss (Albert A) & Son, Inc.
- B. Dial Type Insertion Thermometers:
1. General: Provide diam type insertion thermometers of materials, capacities and ranges indicated, designed and constructed for use in service indicated.
 2. Type: Bi-metal, stainless steel case and stem, 1 inch diameter dial, dust and leak proof, 1/8 inch diameter stem with nominal length of 5 inches.
 3. Accuracy: 0.5 percent of dial range.
 4. Range: Conform to the following:
 - a. Hot Water: 0 degrees - 220 degrees F (-10 degrees - 110 degrees C).
 5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering direct mount dial type insertion thermometers which may be incorporated in the work include, but are not limited to, the

following:

Marsh Instrument Co, Unit of General Signal.

Taylor Instrument Process Control Div. of Sybron Corp.

Trerice (H.O.) Co.

Weiss (Albert A.) & Son, Inc.

C. Thermometer Separable Wells:

1. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2 inch extension for insulated piping.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering thermometer wells which may be incorporated in the work include, but are not limited to the following:

Marsh Instrument Co., Unit of General Signal.

Trerice (H.O.) Co.

Weiss (Albert A.) & Sons, Inc.

D. Temperature Gage Connector Plugs:

1. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200 degrees. Construct of brass and finish in nickel-plate, equip with 1/2 inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8 inch O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering temperature gage connector plugs which may be incorporated in the work include, but are not limited to, the following:

Peterson Engineering Co.

2.02 PRESSURE GAGES AND FITTINGS

A. Pressure Gages:

1. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.

2. Type: General use, 1 percent accuracy, ANSI B40.1, Grade A, phosphor bronze bourbon type, bottom connection.

3. Case: Drawn steel or brass, clear acrylic plastic lends, 4-1/2 inch diameter.

4. Connector: Brass with 1/4 inch male NPT. Provide protective syphon when used for steam service.

5. Scale: White coated aluminum with permanent etched markings.

6. Range: Conform to the following:

a. Water: 0 - 100 psi.

7. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gauges which may be incorporated in the work include, but are not limited to, the following:

Ametek, U.S. Gauge Div.

Marsh Instrument Co., Unit of General Signal.

Marshalltown, an Eltra Company
Tterice (H.O.) Co.
Weiss (Albert A.) & Son, Inc.

- B. Pressure Gage Cocks:
1. General: Provide pressure gauge cocks between pressure gages and gauge tees on piping systems. Construct gage cock of brass with 1/4 inch female NPT on each end, and "T" handle brass plug.
 2. Syphon: 1/4 inch straight coil constructed of brass tubing with 1/2 inch male NPT on each end.
 3. Snubber: 1/4 inch brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
 4. Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gage cocks which may be incorporated in the work include, but are not limited to, the following:
Ametek, U.S. Gauge Div.
Marsh Instrument Co., Unit of General Signal.
Marshalltown, An Eltra Company
Tterice (H.O.) Co.
Weiss (Albert A.) & Son, Inc
- C. Pressure Gage Connector Plugs:
1. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200 degrees Fahrenheit. Construct of brass and finish in nickel-plate, equip with 1/2 inch NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8 inch O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness for insulated piping.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pressure gage connector plugs which may be incorporated in the work include, but are not limited to, the following:
Peterson Engineering Co.

PART 3 - EXECUTION

3.01 INSTALLATION OF TEMPERATURE GAGES

- A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.
- B. Thermometer Separable Wells: Install in piping for each temperature gauge.
- C. Temperature Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.02 INSTALLATION OF PRESSURE GAUGES

- A. General: Install pressure gages in piping with pressure gage cock, located on pipe at most readable position.
- B. Locations: Install in the following locations, and elsewhere as indicated:
 - 1. At suction and discharge of each hydronic pump or as a common gauge, if so detailed on drawings.
 - 2. At each pressure reducing valve on both the high pressure and low-pressure sides.
 - 3. At water service outlet.
- C. Pressure Gage Cocks: Install in piping tee with snubber.
- D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

END OF SECTION 22 05 19

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING

PART 1 - GENERAL

1.01 SCOPE

- A. The requirements for seismic protection measures to be applied to plumbing equipment specified herein are in addition to any other items called for in other sections of these specifications. The seismic protection shall conform to Category D of the 2021 Arkansas Fire Prevention Code. The Plumbing equipment shall include the following items to the extent required on plans or in other sections of the following specifications:

Piping, 2-1/2 inches or larger
Components weighting more than 75 pounds
Water Heaters

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Basic Requirements – Section 22 05 00.

1.03 APPLICABLE PUBLICATIONS

- A. American Society of Civil Engineers: ASCE 7
B. Federal Specifications:
1. RR-W-410D

1.04 REGULATORY REQUIREMENTS

- A. Conform to 2021 Fire Prevention Code.

PART 2 - PRODUCTS

- 2.01** Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.
- 2.02** Sway brace of structural steel conforming with ASTM A36.
- 2.03** Mechanical couplings of the sleeve type to provide a tight flexible joint under all reasonable conditions.
- 2.04** Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B12.2.2 and ASTM A307 or 306.
- 2.05** Guy wires where required shall conform to Fed Spec. RR-W-441 as follows:
- | | |
|-------------------------|-----------------|
| 5/32" diameter | Type V, Class 1 |
| 3/16" to 5/16" diameter | Type V, Class 2 |
| 1/4" to 5/8" diameter | Type I, Class 2 |

PART 3 - EXECUTION

- 3.01** All rigidly mounted equipment will have a minimum of four (4) anchor bolts securely fastened through bases or backs. Anchor bolts must conform to ASTM A307. Anchor bolts shall have an embedded straight length equal to at least twelve times the nominal diameter of the bolt and shall conform to the applicable tables for various equipment weights.

Maximum Equipment Weight (Pounds)	
500	1/2
1,000	1/2
5,000	1/2
10,000	1/2
20,000	1/2
30,000	5/8
50,000	3/4
100,000	1

Based on four (4) bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional area when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure, except that an equipment weight equal to five times the actual equipment weight shall be used

- 3.02** Equipment Sway Bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with no less than 1/2-inch bolts. Braces shall conform to all applicable codes and standards for Seismic Classification. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45-degrees, provided that supporting members are properly sized to supporting operating weight of equipment when inclined at a 45-degree angle.
- 3.03** Sway bracing shall be provided for all 2-1/2 inch or larger pipes, not individually supported with hangers 12 inches or less in length. Longitudinal bracing shall be at 80' max spacing. Traverse bracing shall be at 40' max spacing.
- 3.04** All components that weight more than 75 pounds shall have a safety chain or safety cable in addition to its other support.
- 3.05** Water heaters and pumps shall be bolted to the housekeeping pads in accordance with Paragraph 3.01.
- 3.06** Powder-activated fasteners (shot pins) shall not be used for anchorage.
- 3.07** Vibration isolators shall have a bumper restraint in each horizontal direction, and vertical

restraints shall be provided where required to resist overturning.

- 3.08** Oversized plate washers extending to the equipment wall shall be used at bolted connections through the base sheet metal if the base is not reinforced with stiffeners or not capable of transferring the required loads.

END OF SECTION 22 05 48

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-23 sections.
- B. Type of identification devices specified in this section include the following:
 - Plastic Pipe Markers.
 - Valve Tags.
 - Valve Schedule Frames.
 - Engraved Plastic-Laminate Signs.
 - Ceiling Tacks.
- C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of the equipment assembly in other Division-23 sections.

1.02 RELATED SECTIONS

- A. Section 22 10 05 – Plumbing Piping.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of identification devices of types and sizes required.
- B. ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

1.04 SUBMITTALS

- A. Product Data: Submit product specifications and installation instructions for each identification material and device desired.
- B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.
- C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.

PART 2 - PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

- A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-21 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.
- B. Plastic Pipe Markers:
 - 1. General: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
 - a. Small Pipes: For external diameters less than 6 inches (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - (1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - (2) Adhesive lap joint in pipe marker overlap.
 - (3) Laminated or bonded application of pipe marker to pipe (or insulation).
 - b. Large Pipes: For external diameters of 6 inches and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
 - (1) Laminated or bonded application of pipe marker to pipe (or insulation)
 - (2) Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.
 - c. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
 - d. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
 - 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.
- C. Valve Tags:
 - 1. At the Contractor's option, provide one of the following:
 - a. Brass Valve Tags: provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch diameter tags, except as otherwise indicated.
 - b. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32 inch thick engraved plastic laminate valve tags, with piping

system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch square black tags with white lettering, except as otherwise indicated.

2. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- D. Valve Schedule Frames:
1. General: For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on walls. Provide frames of rigid plastic or metal, with plastic glazing.
- E. Engraved Plastic-Laminate Signs:
1. General: Provide engraving stock melamine plastic laminate, complying with FS L- P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 2. Thickness: 1/16 inch for units up to 20 square inches or 8 inch length; 1/8 inch for larger units.
 3. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plastic pipe markers which may be incorporated in the work include, but are not limited to, the following:
Seton Name Plate Company
EMED Co., Inc.
Kolbi Pipe Marker Co.
Approved equal.

2.02 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/ maintenance of plumbing systems and equipment.
- B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Piping System Identification:

1. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, (shafts, tunnels, plenums), exterior non-concealed locations and above removable acoustical ceilings.
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for fixtures, mark each pipe at branch, where there could be question of flow pattern.
 - c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 - d. At access doors, manholes and similar access points which permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced intermittently at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings.

C. Valve Identification:

1. General: Provide valve tag on every valve, cock and control device in each piping system.
2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
 - a. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

D. Plumbing Equipment Identification:

1. General: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Pumps and similar motor-driven units.
 - c. Fans, blowers, primary balancing dampers and mixing boxes.
 - d. Central-station units.

- e. Tanks and pressure vessels.
 - f. Motor starters and other control equipment.
- E. Refer to Division-22 sections for identification requirements at central-station mechanical control center; not work of this section.
- F. Refer to Division-26 sections for identification requirements of electrical work; not work of this section.
- G. Lettering Size: Minimum 3/8 inch high lettering for name of unity where viewing distance is less than 2'-0"; 3/4 inch high for distances up to 6'-0"; and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 the size of principal lettering.
- H. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, and warn of hazards and improper operations.
- I. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

END OF SECTION 22 05 53

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Insulation Requirements for complete plumbing piping system.

1.02 RELATED SECTIONS

- A. Section 22 05 00 – Common Work Results for Plumbing.
- B. Section 22 05 53 – Identification for Plumbing Piping
- C. Section 22 10 05 – Plumbing Piping.
- D. Section 22 30 00 – Plumbing Equipment.
- E. Section 22 40 00 – Plumbing Fixtures.

1.03 REFERENCES

- A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- F. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- H. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- I. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- J. ASTM E96 - Water Vapor Transmission of Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Division 01 and Section 22 05 00.

- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/100 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 22 05 00.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 - PRODUCTS

2.01 GLASS FIBER

- A. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. "K" value: ASTM C335, 0.24 at 75 degrees F.
 - 2. Minimum Service Temperature: -20 degrees F.
 - 3. Maximum Service Temperature: 850 degrees F.
 - 4. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket:
 - 1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
 - 3. Secure with adhesive applied to longitudinal laps and butt strips.
 - 4. Secure with vapor barrier mastic.

5. Self-sealing laps may be used provided lap seal is additionally sealed with vapor barrier masters.
6. Maximum Water Vapor Transmission: 0.1 perm.

2.02 APPROVED MANUFACTURERS

- A. Glass Fiber:
 1. Owens/Corning Fiberglass.
 2. Johns Manville.
 3. Knauf.
 4. Architect Approved - Other acceptable manufacturers offering equivalent products.
- B. Vapor Barrier Jacket Lap Adhesive - Compatible with insulation:
 1. Foster 25.
 2. Childers.
 3. Architect Approved.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. On exposed piping, locate insulation and cover seams in least visible locations.
- C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory applied or field applied.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
 3. Finish with glass cloth and vapor barrier adhesive.
 4. PVC fitting covers may be used.
 5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
 6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. For insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.

3. Finish with glass cloth and adhesive.
 4. PVC fitting covers may be used.
 5. 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.
 6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- E. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- F. Finish insulation at supports, protrusions, and interruptions.
- G. For 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 or stainless-steel jacket with seams located on bottom side of horizontal piping.
- H. For 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.
- I. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- J. Valves and fittings insulated with block insulation shall be finished with insulating cement and troweled to a smooth and uniform finish.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE PIPING SYSTEMS

THICKNESS

A. Plumbing Systems:	
Domestic Hot Water Supply	1 inch
Domestic Cold Water (Indoors)	1 inch
Domestic Cold Water (Out of Doors)	2 inch

END OF SECTION 22 07 19

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for complete plumbing piping system.

1.02 RELATED SECTIONS

- A. Section 22 05 00 – Common Work Results for Plumbing.
- B. Section 22 05 53 – Identification for Plumbing Piping
- C. Section 22 30 00 – Plumbing Equipment.
- D. Section 22 40 00 – Plumbing Fixtures.
- E. Section 31 23 16 – Excavation.

1.03 QUALITY ASSURANCE

- A. Manufacturers shall be firms regularly engaged in manufacturer of plumbing piping products, of types, materials, and sizes required.
- D. Installer shall be a firm with successful installation experience on projects with plumbing piping system work similar to that required for project.
- E. Comply with applicable provisions of ANSI B31.2 “Fuel Gas Piping”, applicable provisions of NFPA 54 (ANSI Z223.1) “National Fuel Gas Code”, ANSI Z223.1a “Supplement to National Fuel Gas Code” and with requirements of the local gas company.
- F. Comply with applicable codes and standards.

1.04 SUBMITTALS

- A. Submit under provisions of Division 01 and Section 22 05 00.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer’s Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section.

PART 2 - PRODUCTS

2.01 DOMESTIC HOT AND COLD-WATER SYSTEMS

- A. PIPE
1. Type “K” hard drawn copper, as made by Mueller, Cerro Flow, Cambridge-Lee, or Howell, for piping underground or beneath concrete slab.
 2. Type “L” hard drawn copper, as manufactured by Mueller, Cerro Flow, Cambridge-Lee, or Howell, for above ground applications.
- B. FITTINGS
1. Wrought copper.
- C. CONNECTIONS
1. Sweat copper type with Stay-Safe “Bridgit” lead free silver bearing solder with Stay-Clean liquid or Stay-Clean paste flux as manufactured by J. W. Harris Co., Inc. Joints under slabs shall be brazed with Silfos brazing alloy.
- D. VALVES
1. Use ball valves exclusively unless otherwise specified. All valves shall be by a single manufacturer from the approved list (reference Section 221006). Valves shall be for 150psi SWP.
 2. All valves shall be bronze, threaded ends, stainless steel ball, and extended stem.
- E. UNIONS
1. All union connections on piping 2” and smaller shall be ground joint brass union, having brass taper seat and both screw ends hexagonal and shall be designed for a steam working pressure up to 150 pound.
- F. ORIGIN
1. All pipe and fittings shall be manufactured in the United States of America.

2.02 SANITARY SEWER, SOIL, STORM, WASTE AND VENT PIPING SYSTEMS

- A. Piping Above Floor:
1. All lines of 2 inches and larger shall be service weight cast iron soil piping and fittings, coated inside and outside with coal tar varnish and shall be labeled with cast iron mark of quality and permanence as illustrated in Commercial Standard CS188, which indicates that it complies with this Standard.
 2. Pipe and fittings used in the hubless system shall bear the registered insignia indicating that these items used in the system shall comply with the Cast Iron Soil Pipe Institute’s Standard 302 (latest revision) and the ASTM “Standard Specifications for Cast Iron Soil Pipe and Fittings”.
 3. In horizontal installations hangers shall be provided at ever other point except when the developed length between hangers exceeds four feet

(4'0") they shall be provided at each joint. Hangers shall be provided at each horizontal branch and shall be placed on or immediately adjacent to the coupling. Adequate provision shall be made to prevent "shear". Where hubless components are suspended in excess of 18 inches by means of non-rigid hangers, they shall be suitably braced against movement horizontally. Piping at ceiling of mechanical room shall be suspended from spring hangers.

4. Vertical sections and their connecting branches and components shall be secured at each stack base and at sufficiently close intervals to keep the system in alignment and to adequately support the weight of the pipe and its contents.
5. Waste arms for lavatories and urinals shall be DWV copper with cast brass adapters and wrought copper fittings.

B. Piping Below Grade:

1. All piping below the floor and extended outside the building shall be standard weight cast iron soil pipe and fittings unless noted otherwise, as manufactured by Tyler Pipe, Charlotte Pipe, or AB&I Pipe. All cast iron soil pipe and fittings shall be of the reinforced hub type, coated inside and outside with coal tar varnish and shall conform to the ASTM "Standard Specifications for Cast Iron Soil Pipe and Fittings".

C. Soil, waste, drain and vent piping must be of sizes noted and run as indicated on the drawings, and shall be given a uniform grade of 1/4 inch per foot wherever possible, but in no case less than 1/8 inch per foot. The soil and waste pipes shall be extended through the roof. Each riser extending through the roof shall project 14" above roofline. Flashing shall be by roofing contractor. Counter flashing shall be by plumbing contractor. Where so shown, connect vents below roof.

D. Piping Exterior of Building:

1. Sanitary sewer pipe and fittings (exterior of the building) shall be same as waste piping it connects to.

E. Pipe Joints

1. The cast iron hubless joint shall consist of cast iron soil pipe, fittings Clamp All Corporation, Anaheim Foundry Co. "Husky SD4000", or approved equal, hubless soil pipe coupling made of 24-gauge Type 304 stainless steel with Hi-Torque Clamps tightened to 100+125 inch-pounds of torque. Coupling gaskets shall be made of neoprene and shall interlock with the housing assembly to make slip free joint. Pipe and fittings shall be inserted into the sleeve and firmly seated against the center rib or shoulder of the gasket. A sound joint shall be provided in field cut lengths of pipe by having square cut ends as smooth as possible. The stainless-steel bands shall be tightened alternately and firmly to not less than 100 inch-pounds of torque.
2. The reinforced hub cast iron soil pipes shall be joined with Tyler "Ty-Seal" neoprene joints.
3. Support piping at each joint and fitting and 10'-0" maximum spacing.

F. CLEANOUTS

1. Cleanouts shall be provided at the ends and points in change of direction of all drain, soil and waste pipes and branches thereof, at the foot of each riser, at all offsets, in all horizontal runs at approximately 50 foot intervals for piping 4" and smaller and 100' for larger piping, and at other points where indicated on the plans or where required.
2. All cleanouts in connection with cast iron pipe, except the traps and fittings on horizontal branches, shall have tapped "Y" fittings of same size as pipe up to 4 inches, and 4 inches for all larger pipe, closed with screw plugs. All other cleanouts in connection with cast iron pipe, except those that occur in finished floor and walls, shall have heavy cast iron ferrules same size as pipe up to 4 inches, and 4 inches for all larger pipe, caulked into hub and closed with a bronze screw plug.
3. All cleanouts in finished floors shall be Zurn ZN-1400-BP-LC "Level Trol", Wade, or Jay R. Smith, with anchor flange and clamp collar, scoriated nickel-bronze access cover and adjustable frame; bronze cleanout plug shall be straight threaded with tapered shoulder.
4. All cleanouts in finished walls shall be Zurn ZB-1443-BP, Wade, or Jay R. Smith with polished bronze access cover and adjustable frame; bronze cleanout plug shall be straight threaded with tapered shoulder.
5. All cleanouts on exterior piping of building shall be Zurn "Level-Trol" ZN-1400-BP-HD, Wade, or Jay R. Smith, having heavy duty bronze top, as detailed on the Drawings.

G. TRAPS AND DRAINS

1. P-traps shall be placed under all floor drains and where indicated in wastes, and at other points indicated on plans. P-traps shall be standard weight cast iron, deep seal type, bell and spigot pattern.
2. Drains shall be Zurn, Wade, or Jay R. Smith, in accordance with the schedule on the drawings.

H. DRAIN PANS

1. All floor drains, except for those in concrete slab above earthfill, shall be provided with non-plasticized chlorinated polyethylene, "Chloraloy 240", brand concealed water proofing membrane as manufactured by the Noble Company of Grand Haven, Michigan, Compotite Corp. "Composeal", or approved equal. Membrane shall be medium gray in color, textured surface finish both sides, have white or black lettering continuously marked "Chloraloy 240", size 18 inches by 18 inches, turned up at least 1 inch, and meet applicable standards of ASTM. Complete installation shall be in accordance with manufacturer's recommendations.

I. ORIGIN

1. Unless specifically specified otherwise, all material and products shall be manufactured in the United States of America.

PART 3 - EXECUTION

3.01 HOT AND COLD-WATER PIPING SYSTEMS

- A. For general piping insulation, see Section 22 07 19.
- B. Install copper tubing under slabs without joints where possible.
- C. Provide adaptors in copper lines for all valves.
- D. Locate cold water lines a minimum of 12 inches from hot water line.
- E. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two (2) hours and show no leaks.
- F. Sterilize domestic water system with solution containing at least 250 parts per million of available chloride. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
- G. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- H. Water system will not be accepted until a negative bacteriological test is made on water taken from system and dosing shall be repeated as necessary until such negative test is accomplished. Submit written report of test to Architect for his approval.
- I. Install water hammer arresters as noted on the drawings.
- J. Extend water service piping of size and in location indicated to water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry weathertight. Provide gate valve at water service entry inside building, strainer, pressure gauge, test tee and valve.
- K. Provide hot and cold-water piping runouts to fixtures of sizes indicated, but in no case smaller than required by National Standard Plumbing Code.
- L. Connect hot and cold-water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shut-off valve and union for each connection. Provide drain valve on drain connections.

3.02 SANITARY SEWER, SOIL, STORM, WASTE AND VENT PIPING SYSTEMS

- A. Provide floor drains and other specialties as specified in the Schedule on the drawings and set forth in these specifications.
- B. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gasses

pass freely to atmosphere with no pressure of syphon condition on water seal.

- C. Before piping is covered, conduct tests in presence of Architect and correct leaks or defective work. Do not caulk threaded work. Fill waste and vent system to roof level (a minimum of 10 feet) with water and show no leaks for two (2) hours.
- D. Vent entire system to atmosphere. Discharge 14 inches above roof. Joint lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near an edge or valley.
- E. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.
- F. Flash pipes passing through roof with six (6) lb/sq.ft. lead flashing fitted around pipes and turned down into pipe 1/2 inch with turned edge hammered against pipe wall.

END OF SECTION 22 10 05

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Valves and piping specialties, for complete Plumbing System.

1.02 RELATED SECTIONS

- A. Section 22 05 00 – Common Work Results for Plumbing.
- B. Section 22 05 53 – Identification for Plumbing Piping.
- C. Section 22 10 05 – Plumbing Piping.
- D. Section 22 30 00 – Plumbing Equipment.
- E. Section 22 40 00 – Plumbing Fixtures.
- F. Section 31 2 316 – Excavation.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of piping specialties of types and sizes required.

1.04 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for pipeline strainers. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required pipeline strainer.
- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of pipeline strainer. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.01 MANUFACTURED PIPING SPECIALTIES

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Pipe Escutcheons:

1. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
2. Pipe Escutcheons for Moist and Wet Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
3. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

C. Low Pressure Y-Type Pipeline Strainers:

1. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64 inch perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping system.
2. Threaded ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
3. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering low pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:
American Air Filter, an Allis-Chalmers Co.
Armstrong Machine Works.
Hoffman Specialty, ITT Fluid Handling Div.
Metraflex Co.
Sarco Co., Div. of White Consolidated.
Trexco (H.O.) Co.
Victaulic Co. of America

D. High Pressure Y-Type Pipeline Strainers:

1. General: Comply with FCI 73-1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 250 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations at 233 sq. in. Mechanical grooved type strainer may be used in grooved piping systems.
2. Threaded Ends, 2 Inches and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
3. Flanged Ends, 2-1/2 Inches and Larger: Cast-iron body, bolted steel retainer with off-center blowdown fitted with pipe plug.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure Y-type strainers which may be incorporated in the work include, but are not limited to, the following:

American Air Filter, an Allis-Chalmers Co.
Armstrong Machine Works.
Hoffman Specialty, ITT Fluid Handling Div.
Metraflex Co.
Sarco Co., Div. of White Consolidated.
Trerice (H.O.) Co.
Victaulic Co. of America

E. Dielectric Unions:

1. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolates ferrous from non-ferrous piping (electrical conductance), present galvanic action, and stop corrosion.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dielectric unions which may be incorporated in the work include, but are not limited to, the following:
Atlas Products Co.
Capital Mfg. Co., Div. of Harsco Corp.
Eclipse, Inc.
Epco Sales, Inc.
FMC Corp.
McNally, Inc.
PSI Industries.
Stockham Valves and Fittings.

2.02 FABRICATED PIPING SPECIALTIES

- A. Drip Pans: Provide drip pans fabricated from not less than 18-gauge corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2 inches. Reinforce top, either by structural angles or by rolling top over 1/4 inch steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
- B. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3 inches and smaller, 20-gauge; 4 inches to 6 inches, 16-gauge; over 6 inches, 14-gauge.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe, remove burrs.
- C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
1. Lead and Oakum: Caulked between sleeve and pipe.
 2. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.03 VALVES

- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.04 GATE VALVES

- A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.
- B. Comply with the following standards.
 - 1. Cast-Iron Valves: MSS SP-70.
 - 2. Bronze Valves: MSS SP-80.
 - 3. Steel Valves: ANSI B16.34.
- C. For Domestic Water Service:
 - 1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, NIBCO T-111-LF (gate valves only).
 - 2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge, Nibco F-617-0.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following:
 - 1. Milwaukee Valve Company.
 - 2. NIBCO Valve Company.
 - 3. Stockham Valves and Fittings, Inc.

2.05 GLOBE VALVES

- A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.
- B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut. For metal seated globe valves, provide hardened stainless-steel disc and seat ring.
- C. Comply with the following standard:
 - 1. Cast-Iron Valves: MSS SP-85.

2. Bronze Valves: MSS SP-80.
 3. Steel Valves: ANSI B16.34.
- D. For Domestic Water Service:
1. Threaded Ends 2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, composition disc, NIBCO No. T-211Y.
 2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body, bronze trimmed, bolted bonnet, rising stem, OS&Y, renewable seat and disc, NIBCO F-718-B.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:
1. Milwaukee Valve Company.
 2. NIBCO Valve Company.
 3. Stockham Valves and Fittings, Inc.

2.06 DRAIN VALVES

- A. For Low Pressure Drainage Service:
1. Threaded Ends 2 Inches and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4 inch hose outlet connection, Milwaukee 1152M.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO Valve Company.
 - c. Stockham Valves and Fittings, Inc.

2.07 BALL VALVES

- A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.
- B. Comply with the following standards:
1. Steel Valves: ANSI B16.34.
- C. For Domestic Water Service:
1. Threaded Ends 2 inches and smaller: Class 125, bronze 2 piece body, stainless steel ball, bronze, extended stem, Apollo 77c – 14X-04.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball valves which may be incorporated in the work include, but are not limited to the, the following:
1. Milwaukee Valve Company.
 2. NIBCO Valve Company.
 3. Stockham Valves and Fittings, Inc.

4. Apollo: 77c-100 Series.

2.08 SWING CHECK VALVES

- A. General: Construct pressure containing parts of valves as follows:
 1. Bronze Valves, 125 or 150 psi: ANSI/ASTM B62.
 2. Metallic Seated Bronze Valves, 200 or 300 psi: ANSI/ASTM B61.
 3. Iron Body Valves: ANSI/ASTM A126, Grade B.
- B. Comply with MSS SP-71 for design, workmanship, material, and testing.
- C. Construct valves of pressure castings free of any impregnating materials.
- D. Construct valves of bronze, regrinding, with seating angle 40 degrees to 45 degrees, unless composition disc is specified.
- E. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.
- F. Construct disc and hanger as separate parts, with disc free to rotate.
- G. Support hanger pins on both ends by removable side plugs.
- H. For Domestic Water Service:
 1. Threaded Ends 2 inches and smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc, NIBCO T-413-Y-LF.
 2. Flanged Ends 2-1/2 inches and larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast-bronze disc, NIBCO F-918-B.
- I. For Fire Protection System:
 1. Threaded Ends 2 inches and smaller: Class 200, bronze body, bolted cap, horizontal swing, composition disc, UL listed, Stockham B-305-B.
 2. Flanged Ends 2-1/2 inches and larger: Class 2005, iron body bronze mounted, bolted cap, horizontal swing, malleable iron disc, UL/FM approved, Stockham G-939.
- J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to, the following:
 1. Milwaukee Valve Company
 2. NIBCO Valve Company.
 3. Stockham Valves and Fittings, Inc.

2.09 VALVE FEATURES

- A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

- B. Bypass: Comply with MSS SP-45, and except as otherwise indicated provide manufacturer's standard bypass piping and valving.
- C. Drain: Comply with MSS SP-45, and provide threaded pipe plug complying with Division-22 "Pipe, Tube, and Fittings" section.
- D. Flanged: Valve flanges complying with ANSI B16.5 (steel) or ANSI B16.24 (bronze).
- E. Threaded: Valve ends complying with ANSI B2.1.
- F. Butt-Welding: Valve ends complying with ANSI B16.25.
- G. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
- H. Wafer: Flangeless valves.
- I. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry.
- J. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.
- K. Renewable Seat: Design seat of valve with removable disc, and assembly valve so disc can be replaced when worn.
- L. Extended Stem: Increase stem length by 2 inches minimum, to accommodate insulation applied over valve.
- M. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment, and chain designed to provide mechanical advantage in operating valve.
- N. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union, or welding.
- O. Solid Wedge: One-piece tapered disc in gate valve, designed for contact on both sides.
- P. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.

2.10 PRESSURE RELIEF VALVES

- A. Body: Bronze or iron with testing lever.

- B. Trim: Bronze or stainless steel.
- C. Construction: Comply with ASME Code for Pressure Vessels, Section VIII and shall bear ASME stamp.
- D. Maximum Permissible over Pressure: 25 percent (water).
- E. APPROVED MANUFACTURERS
 - 1. Bell and Gossett.
 - 2. McDonnell Miller.
 - 3. Kunkle Valve Company.

2.11 PRESSURE REDUCING VALVES

- A. Body: Cast iron.
- B. Trim: Bronze.
- C. Rating: 125 psig working pressure at 200 degrees F.
- D. Operator: Spring loaded diaphragm with adjustable range.
- E. Diaphragms and Disc: Nitrile.
- F. Pressure Reducing Valves - Water Service:
 - 1. Spence Regulators - Type D 34.
 - 2. Watts Regulators.
 - 3. Architect Approved.

2.12 BACK FLOW PREVENTERS

- A. Reduced pressure type. Rated 175 psig at 140 degrees F, manufactured in the United States of America.
- B. Body:
 - 1. Bronze construction.
 - 2. Bronze body test cocks.
 - 3. NPT body connections.
 - 4. Non-rising stem gate valves.
- C. Check Valve:
 - 1. Celcon seats.
 - 2. Rubber check valve.
- D. Relief Valve:
 - 1. Stainless steel seat.
 - 2. Stainless steel shaft and flange bolts.

- E. APPROVED MANUFACTURERS
 - 1. Watts Regulator Series 909-SAG.
 - 2. Wilkins Regulators.
 - 3. Febco.

2.13 HORIZONTAL-PIPING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
- B. Adjustable Steel Clevises: MSS Type 1.
- C. Steel Double Bolt Pipe Clamps: MSS Type 3.
- D. Adjustable Swivel Pipe Rings: MSS Type 6.
- E. Split Pipe Rings: MSS Type 11.
- F. Extension Split Pipe Clamps: MSS Type 12.
- G. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.
- H. Pipe Stanchion Saddle: MSS Type 37, including steel pipe base support and cast-iron floor flange.
- I. Adjustable Pipe Saddle Supports: MSS Type 38 including steel pipe base support and cast-iron floor flange.
- J. Single Pipe Rolls: MSS Type 41.
- K. Adjustable Roller Hangers: MSS Type 43.

2.14 VERTICAL-PIPING CLAMPS

- A. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

- B. Two-Bolt Riser Clamps: MSS Type 8.
- C. Four-Bolt Riser Clamps: MSS Type 42.

2.15 HANGER-ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
- B. Steel Turnbuckles: MSS Type 13.
- C. Swivel Turnbuckles: MSS Type 15.
- D. Malleable Iron Sockets: MSS Type 16.
- E. Steel Weldless Eye Nuts: MSS Type 17.

2.16 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- B. Concrete Inserts: MSS Type 18.
- C. Top Beam C-Clamps: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. C-Clamps: MSS Type 23.
- G. Top I-Beam Clamps: MSS Type 25.
- H. Side I-Beam Clamps: MSS Type 27.
- I. Steel I-Beam Clamps with Eye Nut: MSS Type 28.
- J. Steel WF-Beam Clamps with Eye Nut: MSS Type 29.

- K. Malleable Beam Clamps: MSS Type 30.
- L. Steel Brackets: One of the following for indicated loading:
 - Light Duty: MSS Type 31.
 - Medium Duty: MSS Type 32.
 - Heavy Duty: MSS Type 33.

2.17 SADDLES AND SHIELDS

- A. General: Except as otherwise indicated, provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Side saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

2.18 MANUFACTURERS OF HANGERS AND SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hangers and supports which may be incorporated in the work include, but are not limited to the following:
 - C & S Mfg. Corp.
 - Carpenter and Patterson, Inc.
 - Elcen Metal Products Co.
 - F & S Central Mfg. Corp.
 - ITT Grinnell Corp.

2.19 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA Std. ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A36.
- C. Cement Grout: Portland cement (ANSI/ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for load required; weld steel in accordance with AWS standards.
- E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size the guide and spiders to clear

pipe and insulation (if any) by cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 - EXECUTION

3.01 INSTALLATION OF MANUFACTURED PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2 inches and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
 - 1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment.
 - Pumps.
 - Steam traps serving steam main drips.
 - Temperature control valves.
 - Pressure reducing valves.
 - Temperature or pressure regulating valves.
- C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.02 INSTALLATION OF FABRICATED PIPING SPECIALTIES

- A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1 inch drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
- B. Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface except floor sleeve. Extend floor sleeves 1/4 inch above level floor finish, and 3/4 inch above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and

provide temporary closure to prevent concrete and other materials from entering sleeves.

1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
2. Install iron-pipe sleeves at exterior penetrations, both above and below grade.
3. Install steel-pipe sleeves except as otherwise indicated.

C. Sleeve Seals: Install in accordance with the following:

1. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

3.03 INSTALLATION OF VALVES

- A. General: Except as otherwise indicated, comply with the following requirements.
1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.
- D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.
- E. Mechanical Actuators: Install mechanical actuator with chain operators where indicated, and where valves 4" and larger are mounted more than 7'-0" above floor in mechanical rooms, boiler rooms; and where recommended by valve manufacturer because of valve size, pressure differential or other operating condition making manual operation difficult.
- F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections.
1. Pipe Size 2 inches and smaller: One of the following, at Installer's option:
 - a. Threaded valves.
 - b. Grooved-end valves (Fire Protection Only).

- c. Flanged valves.
- 2. Pipe Size 2-1/2 inches and larger: One of the following, at Installer's option:
 - a. Grooved-end valves (Fire Protection Only).
 - b. Flanged valves.
- G. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- H. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- I. Renewable Seats: Select and install valves with renewable seats except where otherwise indicated.
- J. Fluid Control: Except as otherwise indicated, install, gate, ball, globe and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valve.
- K. Installation of Check Valves:
 - 1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
 - 2. Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
 - 3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
 - 4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.

3.04 INSTALLATION OF BACKFLOW PREVENTERS

- A. Install backflow preventers where shown on the plans with elbow and air gap, and as may be required to prevent cross contamination of potable water systems.
- B. Pipe discharge drain to nearest floor drain.

3.05 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work,

inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.06 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations, within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-59. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.07 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
 - 1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
 - 2. Support fire-water piping independently of other piping.
 - 3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- B. Provisions for Movement:
 - 1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion bends and similar units.
 - 2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
 - 3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.
- C. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps

projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install galvanized coated protective shields. Install Foam-Glas insulation saddles.
3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.08 INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximum recommended by manufacturer for each unit.
- D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors, as required to accommodate both expansion and contraction of piping.

3.09 ADJUSTMENT OF HANGERS AND SUPPORTS

- A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

3.10 EQUIPMENT BASES

- A. Concrete housekeeping bases will be provided as work of Division 3. Furnish to Contractor, scaled layouts of all required bases with dimensions of bases, and location to column center lines. Furnish templates, anchor bolts, and accessories, necessary for base construction.
- B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands. Structural steel stands to be supported from housekeeping pad bases. Steel supports shall not be allowed to be in direct contact with slab floors.

END OF SECTION 22 10 06

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Water Heaters.
- B. Pumps.

1.02 RELATED SECTIONS

- A. Section 22 0500 – Common Work Results for Plumbing.
- B. Section 22 0553 – Identification for Plumbing Piping
- C. Section 22 1005 – Plumbing Piping.
- D. Section 22 4000 – Plumbing Fixtures.

1.03 REFERENCES

- A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.
- B. ASME Section VIII - Pressure Vessels; Boiler and Pressure Vessel Codes.
- C. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.
- D. ANSI/NFPA 54 - National Fuel Gas Code.
- E. ANSI/NFPA 70 - National Electrical Code.
- F. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 Volts Maximum).

1.04 SUBMITTALS

- A. Submit under provisions of Division 01 and Section 22 0500.
- B. Shop Drawings:
 - 1. Include heat exchanger dimensions, size of tappings, and performance data.
 - 2. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Product Data:
 - 1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Provide electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions.

1.05 OPERATION AND MAINTENANCE DATA:

- A. Submit under provisions of Division 01 and Section 22 0500.
- B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with Arkansas State Plumbing Code.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. National Sanitation Foundation (NSF).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 4. National Electrical Manufacturers' Association (NEMA).
 - 5. Underwriters Laboratories (UL).
- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.07 REGULATORY REQUIREMENTS

- A. Conform to AGA, NSF, NBBPVI, ANSI/NFPA 54, ANSI/NFPA 58, ANSI/NFPA 70, ANSI/UL 174, and ANSI/UL 1453 requirements for water heaters.
- B. Conform to ASME Section VIII for manufacture of pressure vessels for heat exchangers.
- C. Conform to ASME Section VIII, ANSI/NFPA 30, and ANSI/NFPA 31 for tanks.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 22 0500.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

- A. Provide one year warranty under provisions of hereinafter set forth.
- B. Warranty: Include coverage of domestic water heaters, hot water return pumps and submersible sump pumps.

PART 2 - PRODUCTS

2.01 WATER HEATERS

- A. REFER TO PLUMBING EQUIPMENT SCHEDULE ON DRAWINGS.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to AGA, NSF, ANSI/NFPA 54 and UL requirements.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.
- C. Install tanks in accordance with manufacturer's instructions.
- D. Pipe relief valves and drains to nearest floor drain or as noted on drawings.

3.02 GUARANTEE

- A. The entire installation shall be guaranteed for one (1) year against defective equipment, materials and workmanship beginning on signing of substantial completion form.

END OF SECTION 22 30 00

PART 1 - GENERAL**1.01 SCOPE**

- A. Includes:
 - 1. Plumbing fixtures complete with associated trim and fittings, necessary to make a complete installation from wall or floor connections to rough piping and accessories.
- B. All fixtures shall be caulked between the fixture and the mounting surface with white or clear Silicone rubber non-absorbent caulking component.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 22 05 00 – Common Work Results for Plumbing Piping and Equipment.
- B. Section 22 10 05 – Plumbing Piping.
- C. Section 22 30 00 – Plumbing Equipment.

1.03 QUALITY ASSURANCE

- A. Die-cast zinc alloy will not be accepted.
- B. All faucets, stops, and traps shall be of the same manufacturer unless herein noted otherwise.
- C. Corrosion-resistant steel (CRS).
 - 1. CRS flat products shall conform to not less than chemical composition requirements of any 300 series steel specified in ASTM A276.
 - 2. Exposed surfaces shall have standard polish (ground and polished) equal to Finish No. 4 as specified in NAAMM.
- D. All enameled ironware shall be acid resisting.
- E. All fixtures shall be new and best of their respective kinds. They shall be non-absorbent throughout and free from waves, kiln marks or discoloration.
- F. All surfaces coming in contact with walls, floors, or surface of other fixtures shall be ground truly flat and shall be bedded with fine dental plaster before being caulked to wall with silicone sealant.
- G. Job must be turned over to the Owner with all fixtures clean and free from damage. All fixtures including service sinks shall be protected during construction with application of material sufficient to prevent use and damage by personnel and equipment.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 and Section 22 05 00.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Installation Instructions.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01300 and Section 22 05 00.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 22 05 00.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as instructed by the manufacturer.
- B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

1.08 WARRANTY

- A. Provide year warranty under provisions of Section 22 05 00.

1.09 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.
 - 1. American National Standards (ANSI):
 - A112.1.2-42.....Air Gaps in Plumbing System
 - A112.6.1M-79.....Supports for Off-the-Floor Plumbing Fixtures for Public Use
 - A112.18.1M-79....Finished and Rough Brass Plumbing Fixture Fittings
 - A112.19.1M-79....Enameled Cast Iron Plumbing Fixtures
 - A112.19.2-82.....Vitreous China Plumbing Fixtures
 - 2. American Society for Testing and Materials (ASTM):
 - A276-83.....Stainless and Heat-Resisting Steel Bars and Shapes
 - 3. National Association of Architectural Metal Manufacturers (NAAMM):
 - Metal Finishes Manual.

PART 2 - PRODUCTS

2.01 GENERALLY

- A. This contractor shall furnish and install complete all fixtures shown on the plans and hereinafter specified.
- B. All fixtures shall be new and best of their respective kinds. They shall be non-absorbent throughout and free from waves, kiln marks or discoloration.

- C. All surfaces coming in contact with walls, floors or surface of other fixtures shall be ground truly flat and shall be bedded with fine dental plaster before being caulked to wall with silicone sealant.
- D. All fixtures shall have water hammer arresters equal to Zurn or Wade, installed in their water supplies as shown on Drawings or as recommended by the shock absorber manufacturer.
- E. Provide polished chromium plated, heavy brass lock-shield loose key or screwdriver pattern angle stops, straight stops, or stops integral with faucet, with each compression type faucet whether specifically called for or not. Locate stops centrally above or below fixture in accessible location. Furnish keys for lock-shield stops to Owner upon completion of installation. All supplies shall be I.P.S. brass.
- F. Traps shall be two piece chrome plated cast brass P-traps with cleanout and 1/2" gage tubing outlet with escutcheon.
- G. All escutcheons on supplies and wastes shall be heavy chrome plated cast brass set screw type.
- H. All faucets throughout shall have removable units comprising all the wearing parts.
- I. Unless specifically specified otherwise, all fixture trim, stops, and traps shall be of the same manufacturer.
- J. Protect fixtures against use and damage during construction in a manner approved by the Architect. Job must be turned over to the Owner with all fixtures and trim clean and free from damage. Fixtures shall not be used during construction unless approved by the Owner and/or Architect/Engineer.
- K. All sink and lavatory type plumbing fixtures to have loose key type stops and flexible supply risers (unless noted otherwise).
- L. All exposed plumbing piping shall be chrome plated unless noted otherwise.
- M. The Contractor must review the Architectural Drawings for exact location of plumbing fixtures and floor drains. If a plumbing fixture or floor drain is shown on the Architectural Drawings, it must be included in the Contract even if it does not appear on the Mechanical Drawings.
- N. All thermostatic and pressure balancing mixing valves shall have check stops on the hot and cold supplies.
- O. All hot and cold-water supplies to plumbing fixtures or to shower heads shall have a "Drop Ell" fitting securely attached, inside wall, to prevent movement.
- P. All lavatory or sink fixtures designated for handicapped use must have insulation.
- Q. All drinking fountain bubblers shall be chrome plated brass.
- R. All lavatory and urinal waste arms shall be DWV copper with cast brass adapters and wrought copper fittings.

- S. All water closet flush valves that have grab bars mounted on walls behind them shall have a minimum of 1-1/2 inch flush valve pipe offset to clear grab bar. Coordinate with Architectural drawings.
- T. All handicapped water closet flush valves shall be roughed-in and installed so that the flush valve control will be on the wide side of the toilet stall. Contractor shall coordinate this.
- U. All water closet flush valves shall have cast wall flange with set screw, and be supplied with sweat-solder adapter kits.
- V. Check millwork architectural and shop drawings. Verify exact location and size of fixtures and openings before rough-in and installation. Coordinate with millwork supplier for special cutouts, blocking, special or additional supports, etc.
- W. This contractor shall furnish and install all backing for lavatories, or any equipment requiring same.
- X. Job must be turned over to the Owner with all fixtures clean and free from damage.
- Y. Where water closets, lavatories or sinks are installed back-to-back, and carriers are specified, provide one carrier to serve both fixtures in lieu of individual carriers, unless noted otherwise on Drawings.

2.02 STOPS

- A. Provide polished chromium plated, heavy brass lock-shield loose key or screw driver pattern angle stops, straight stops, or stops integral with faucet, with each type faucet whether specifically called for or not, including sinks in wood and metal casework, laboratory furniture and pharmacy furniture. Locate stops centrally above or below fixture in an accessible location with 6 inch minimum length chrome plated brass nipples from wall and escutcheon. Furnish keys for lock-shield stops to Owner upon completion of installation.

2.03 TRAPS

- A. Two piece chromium plated cast brass with cleanout and 17-gauge tubing outlet with cast brass set screw type escutcheon.

2.04 ESCUTCHEONS

- A. All escutcheons on supplies and wastes shall be heavy pattern, chrome plated, cast brass set screw type.

2.05 FAUCETS

- A. All faucets shall be provided with aerators unless specified otherwise and shall have removable units comprising all the wearing parts.

2.06 CARRIERS

- A. Where water closets, lavatories or sinks are installed back-to-back, and carriers are specified, provide one carrier to serve both fixtures in lieu of individual carriers.

2.07 FIXTURES

- A. SEE DRAWINGS FOR PLUMBING FIXTURE SCHEDULE.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fixture Setting: Opening between fixture and floor and wall finish shall be caulked with white or clear Silicone sealants which complement the fixture color.
- B. Supports and Fastening: Secure all fixtures, equipment and trimmings to partitions, walls, etc. with brass through bolts, toggle bolts, expansion bolts, or power set fasteners, as required. Exposed heads of bolts and nuts in finished rooms to be hexagonal, polished chromium plated brass with rounded tops.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Install components level and plumb secured in place with wall carriers and bolts.

3.03 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Provide adjustment of all stops, valves, faucets, etc., for intended water flow rates to fixtures, as required to eliminate excessive splashing, noise, or overflow.
- C. Where water closet waste pipe has to be offset due to beam interference, provide correction and/or additional piping necessary to eliminate relocation of water closet.

3.04 CLEANING

- A. At completion of all work, fixtures, exposed materials, accessible chases and equipment shall be thoroughly cleaned of all manufacture's labels, papers, paint, paste, and other foreign material.

3.05 FIXTURE HEIGHTS

- A. Install fixtures to heights above finished floor as herein specified and indicated on the Architectural drawings. Architectural drawings shall rule where discrepancies occur.

END OF SECTION 22 40 00

COMMON WORK RESULTS FOR HEATING, VENTILATING AND AIR CONDITIONING**PART 1- GENERAL****1.01 SECTION INCLUDES**

- A. Basic Requirements for complete heating, ventilating, and air conditioning system.

1.02 RELATED SECTIONS

- A. Division 23 – All Sections.

1.03 SITE INSPECTION

- A. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.04 DRAWINGS

- A. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc. Follow closely as actual building construction and work of other trades will permit.
- B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.
- C. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories required to meet the conditions.
- D. Record difference between mechanical work as installed and as shown in Contract Documents on a set of prints of mechanical drawings to be furnished by Architect. Return these prints to Architect at completion of project. These will be labeled "Contractor Revised Drawings".

1.05 SUBSTITUTIONS

- A. The naming of specified items on the drawings or in the specifications is intended to establish a level of quality and performance. Substitution requests may be submitted at the time of shop drawing submittal. Review of substituted equipment or material prior to the Bid Date will not be considered unless otherwise specified.
- B. Substitution shall be submitted as specified in Division 01.

1.06 CODE REQUIREMENTS, FEES & PERMITS

- A. Perform work in accordance with applicable provisions of state and local Plumbing Code, gas ordinances and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations and ordinances.
- B. In case of differences between building codes, state laws, local ordinances, utility company

regulations and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.

1.07 EQUIPMENT AND MATERIALS

- A. Product Approvals:
 - 1. If approval is received to use other than specified items, responsibility for specified capacities and ensuring that items to be furnished will fit space available lies with this Division.
 - 2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in specification.
- B. Use domestic made pipe, pipe fittings and motors on project.
- C. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connection and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.
- D. Follow Manufacturer's directions in delivery, storage, protection and installation of equipment and materials.
 - 1. Promptly notify Architect in writing of conflicts between requirements of Contract Documents and manufacturer's directions and obtain Architect's written instructions before proceeding with work. Bear expenses arising from correcting deficiencies of work that do not comply with Manufacturer's directions or such written instructions from Architect.
- E. Deliver equipment and material to site and tightly cover to protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.08 REVIEW OF MATERIALS AND EQUIPMENT

- A. Furnish complete catalog data for manufactured items of equipment to be used in Work to Architect for review within 30 days after award of Contract.
- B. Submit six (6) copies of data in 3-ring binders with tab indices in same order and name as they appear in specification.
 - 1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions and other pertinent information. Pertinent information shall include as a minimum those items as scheduled on the drawings. Arrange submittal information to reflect these categories scheduled on the drawings.
 - 2. Provide an index of tab numbers at the front of each binder. List the specification number and category included under each tab as described in the specifications and as scheduled on the drawings.
 - 3. Provide cover sheet for each tab section. List each piece of equipment by name, model number and supplier.
 - 4. Underline applicable data and indicate model being supplied on each submittal sheet.
- C. If data is not submitted as specified or submittal is not complete, it will be returned without review.
- D. Catalog data or shop drawings for equipment which are noted as being reviewed by the Architect, shall not supersede Contract Documents.

- E. Review comments of Architect shall not relieve this Division from responsibility for deviations from Contract Documents unless Architect's attention has been called to such deviations in writing at the time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- F. Check work described in catalog data with Contract Documents for deviations and errors.

1.09 OPERATIONS AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS

- A. Bind two (2) Operations & Maintenance Manuals for Mechanical Systems in 3-ring, hardback binders. Spline of each binder shall have the following lettering done in silk-screen:

OPERATION AND MAINTENANCE MANUAL
FOR MECHANICAL SYSTEMS OF
NORTHEAST REGIONAL FIELD OFFICE RENOVATIONS
ARKANSAS GAME AND FISH COMMISSION
JONESBORO, ARKANSAS

- 1. Provide a master index at beginning of Manual showing items included. Include name and phone number of nearest supplier and Manufacturer's representative. Use plastic tab indexes for sections of Manual.
 - 2. Step by step procedure to follow in putting each piece of mechanical equipment into operation.
 - 3. Provide schematic control diagrams for each separate fan system, refrigeration system, heating system, control panel, etc. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gages, automatic valves and refrigeration accessories. Mark correct operating settings for each control instrument on these diagrams.
 - 4. Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches and relays.
 - 5. Provide drawings of each temperature control panel identifying components on the panels and their function.
- B. Maintenance instructions shall include:
 - 1. Manufacturer's maintenance instructions for each piece of mechanical equipment installed in project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operations instructions of equipment and maintenance and lubrication instructions.
 - 2. Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
 - 3. List of mechanical equipment used indicating name, model, serial number and nameplate data of each item together with number and name associated with each system item.
- C. Air Balance and Test Run Reports:
 - 1. Include a copy of air balance reports and certifications.

2. Include a copy of the 3-day operating test data.
- D. Provide a complete set of approved shop drawing submittals as an Appendix item.

1.10 OPERATIONS AND MAINTENANCE INSTRUCTIONS

- A. Instruct Owner/Owner's Representative in operation and maintenance of mechanical systems utilizing Operations and Maintenance Manual when so doing.
- B. Instruction periods shall occur after pre-final inspection when systems are properly working and before final payment is made.
- C. None of these instructional periods shall overlap another.

1.11 VISIT SITE

- A. This contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause for extras after the contract is signed by reason of unforeseen conditions. Any existing electric wiring and conduit, gas, water drainage piping encountered within the building area shall be relocated or removed where required by this contractor at no extra cost to the Owner.

1.12 CONTRACTOR REVISED DRAWINGS

- A. The contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.
- B. Exact location of all underground utility service entrances and their connections to utility mains, well heads, loop piping and all valves, etc., which will be concealed in the finished work shall be accurately indicated on the drawings by measured distances.
- C. Upon completion of the work and prior to final payment, the contractor shall furnish to the Architect, one set of "contractor revised" prints, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.
- D. Contractor shall include all addendum items and field change order information on the revised drawings. Revise all schedules shown on the drawings to reflect the actual model numbers, capacities and electrical characteristics of substituted equipment.

1.13 COORDINATION OF WORK

- A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to Architect. Should conditions arise where certain changes would be advisable, secure Architect's approval of these changes before proceeding with work.
- B. Coordinate work of various trades in installing inter-related work. Before installation of mechanical items, make proper provisions to avoid interferences in a manner approved by Architect. Changes required in work specified in Division 23 caused by neglect to do so shall be made at no cost to Owner.
- C. Provide inserts and supports required by Division 23 unless otherwise noted. Furnish

sleeves, inserts, supports and equipment that are an integral part of other divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location of installation of items above shall be borne by Division 23.

- D. Be responsible for required digging, cutting and patching incident to work of this Division and make required repairs afterward to satisfaction of Architect. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns or trusses.
 - 1. Each Section of this Division shall bear expense of cutting, patching, repairing and replacing of work of other Sections required because of its fault, error, tardiness or because of damage done by it.
 - 2. Cutting, patching, repairing and replacing pavements, sidewalks, roads and curbs to permit installation of work of this Division is responsibility of Section installing work.
- E. Adjust locations of pipes, etc. to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
 - 1. Make offsets, transitions, and changes in direction of pipes, as required to maintain proper headroom and pitch of sloping lines whether or not indicated on Drawings.
- F. Slots and openings through floors, walls, ceilings and roofs shall be provided by other Divisions in their respective materials. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.14 GENERAL PIPING INSTALLATION

- A. Furnish and install a complete system of piping. The piping drawings are diagrammatic and indicate the general location and connections. If the size of any piping is not clearly evident, obtain instructions from the Architect before proceeding with the work. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the contractor from responsibility for the proper erection of systems of piping in every respect suitable for the work intended. Piping systems that are not to be installed complete shall be so noted.
- B. Erection: Piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing. Remove all burrs and cutting slag by reaming or other cleaning methods. Changes in direction shall be made with fittings, except that bendings of pipe will be permitted, providing a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformation will not be acceptable. Piping shall be arranged so as not to interfere with removal of other equipment or devices nor to block access manholes or other access openings. Piping shall be installed to insure noiseless circulation.
- C. Protection: Open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the system. Plugs of rags, wood, cotton, concrete, waste or similar materials must not be used in plugging.
- D. Cleaning and Flushing: Contractor shall take every precaution to remove dirt, grease, and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be flushed with clean water except where specified otherwise.
- E. Pipe Sizes: If the size of any piping is not clearly evident in the drawings, the contractor shall request instructions from the Architect as to the proper sizing. Any changes resulting from the contractor's failure to request clarification shall be at his expense.

1.15 THERMAL AND MOISTURE PROTECTION

- A. Install flashing, counterflashing and caulk or seal all penetrations in exterior walls or floors as required to prevent exterior moisture from entering building.

1.16 GUARANTEE

- A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or in the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.
- B. The Contractor shall, after completion of the original test of the installation, and acceptance of the Architect, provide any service incidental to the proper performance of the mechanical systems under guarantees outlined above for a period of one (1) year.

1.17 FINALLY

- A. It is the intention that this specification shall provide a complete installation except as hereinbefore specifically excepted. All accessory construction and apparatus necessary or advantageous in the operation and testing of the work shall be included.
- B. 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.

PART 2 - PRODUCTS

Not Applicable.

PART 3-EXECUTION

Not Applicable.

END OF SECTION 23 05 00

COMMON ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. This section specifies the basic requirements for electrical components which are an integral part of packaged HVAC equipment. These components include, but are not limited to factory installed motors furnished as an integral part of plumbing equipment.
- B. This section specifies the basic requirements for electrical components required to be furnished under Division 23, which are to be turned over to and installed by Division 26. These components include but are not limited to motors.
- C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for plumbing equipment are scheduled on the drawings.

1.02 RELATED SECTIONS

- A. Section 23 34 23 – HVAC Power Ventilators.
- B. Section 23 62 13 – Air Cooled Outdoor Heat Pump Units.
- C. Section 23 81 27 – Split System Air Handling Units with Coils.

1.03 REFERENCES

- A. NEMA Standards MG-1: Motors and Generators.
- B. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.
- C. NEMA Standard 250: Enclosures for Electrical Equipment.
- D. NEMA Standard KS 1: Enclosed Switches.
- E. Comply with National Electrical Code (NFPA 70).
- F. Compliance and Labeling: Provide motors and starters which have been listed and labeled by a nationally recognized testing facility engaged in and equipped to test electrical equipment and materials.

1.04 SUBMITTALS

- A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

- A. Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.01 MOTORS

- A. The following are basic requirements for simple or common motors, for special motors, more detailed and specific requirements are specified in the individual equipment specifications.
1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
 2. Motor sizes shall be large enough so that driven load will not requirement the motor to operate in the service factor range.
 3. 2-speed motors shall be 2 separate windings on polyphase motors.
 4. Temperature Rating: Rated for 40 deg. environment, with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).
 5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly timed spaced starts per hour for manually controlled motors.
 6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
- B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
1. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
 2. Bearings:
 - a. Ball or roller bearings with inner and outer shaft seals;
 - b. Regreasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
 - c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
 - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
 3. Enclosure Type:
 - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants;
 - c. Weather protected Type I for outdoor use, Type II where not housed;
 4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
 5. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.
 6. Efficiency: Provide "Energy Efficient" motors with a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a minimum efficiency as listed below.
- | | | | |
|--------------|-----------|-------------|-----|
| 1HP | 80% Eff'y | 10HP | 87% |
| 1-1/2 to 2HP | 82% | 15HP | 89% |
| 3HP | 83% | 20HP | 90% |
| 5HP | 84% | 25HP and up | 91% |
| 7-1/2 HP | 85% | | |
- C. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

Baldor Electric Co.
Century Electric, Inc.
General Electric Co.
Marathon Electric Mfg. Co.
Reliance Electric Co.
Westinghouse Electric Corp.

- D. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 23 05 13

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Pipe and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.02 RELATED SECTIONS

- A. Section 03 3000 - Cast-In-Place Concrete: Equipment bases.
- B. Section 23 07 19 – HVAC Piping Insulation.
- C. Section 23 23 00 – Refrigerant and Humidity Drain Piping.

1.03 REFERENCES

- A. ASME B31.2 - Fuel Gas Piping
- B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

1.04 SUBMITTALS

- A. Submit under provisions of Section 23 05 00 and Section 01 33 00.
- B. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

PART 2 - PRODUCTS**2.01 PIPE HANGERS AND SUPPORTS**

- A. Plumbing Piping - Water:
 - 1. Conform to ASME B31.9 and ASTM F708.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, 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 to 4 Inches: Carbon steel, adjustable, clevis.
 - 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 6. Wall Support for Pipe: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 10. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.02 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.03 FLASHING

- A. Metal Flashing: 28 gauge 304 stainless steel.
- B. Copper Flashing: 16 oz./sq. ft.
- C. Lead Flashing:
 - 1. Waterproofing: 6 lb/sq ft.
- D. Caps: Steel, 22 gage minimum; 16 gauge at fire resistant elements.

2.04 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe.
- C. Sleeves for Ductwork and Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Galvanized steel.
- E. Sleeves for Rectangular Ductwork: Galvanized steel.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide

multiple or trapeze hangers.

- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, where indicated on Drawings, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00. Coordinate exact size requirement for pads.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 4 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor drains watertight to adjacent materials.
- E. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates fire or smoke rated floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk. Provide close fitting metal collar or escutcheon covers at

both sides of penetration. Secure collar or escutcheon to prevent blow-out. Fire stopping materials shall meet requirements of ASTM E119.

- E. Install chrome plated steel escutcheons at finished surfaces.

3.06 SCHEDULES

HANGER ROD

PIPE SIZE Inches	MAX. HANGER SPACING Feet	DIAMETER Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8

END OF SECTION 23 05 29

VIBRATION AND SEISMIC CONTROLS FOR HVAC SYSTEMS**PART 1 - GENERAL****1.01 SCOPE**

- A. The requirements for seismic protection measures to be applied to HVAC equipment specified herein are in addition to any other items called for in other sections of these specifications. The seismic protection shall conform to Category D of the 2021 Arkansas Fire Prevention Code. The HVAC equipment shall include the following items to the extent required on plans or in other sections of the following specifications:
 Ductwork larger than five (5) square feet in cross section
 Air Handling Units
 Heat Pump Units
 Fans

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Basic Requirements – Section 23 05 00.

1.03 APPLICABLE PUBLICATIONS

- A. American Society of Civil Engineers: ASCE 7
- B. Federal Specifications:
 - 1. RR-W-410D

1.04 REGULATORY REQUIREMENTS

- A. Conform to 2021 Fire Prevention Code.

PART 2 - PRODUCTS

- 2.01** Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.
- 2.02** Sway brace of structural steel conforming with ASTM A36.
- 2.03** Mechanical couplings of the sleeve type to provide a tight flexible joint under all reasonable conditions.
- 2.04** Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B12.2.2 and ASTM A307 or 306.
- 2.05** Guy wires where required shall conform to Fed Spec. RR-W-441 as follows:

5/32" diameter	Type V, Class 1
3/16" to 5/16" diameter	Type V, Class 2
1/4" to 5/8" diameter	Type I, Class 2

PART 3 - EXECUTION

- 3.01** All rigidly mounted equipment will have a minimum of four (4) anchor bolts securely fastened through bases or backs. Anchor bolts must conform to ASTM A307. Anchor bolts shall have an embedded straight length equal to at least twelve times the nominal diameter of the bolt and shall conform to the applicable tables for various equipment weights.

Maximum Equipment

<u>Weight (Pounds)</u>	
500	1/2
1,000	1/2
5,000	1/2
10,000	1/2
20,000	1/2
30,000	5/8
50,000	3/4
100,000	1

Based on four (4) bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional area when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure, except that an equipment weight equal to five times the actual equipment weight shall be used

- 3.02** Equipment Sway Bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with no less than 1/2-inch bolts. Braces shall conform to all applicable codes and standards for Seismic Classification. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45-degrees, provided that supporting members are properly sized to supporting operating weight of equipment when inclined at a 45-degree angle.
- 3.03** Sway bracing shall be provided for all 2-1/2 inch or larger pipes, not individually supported with hangers 12 inches or less in length.
- 3.04** Sway bracing shall be provided for ductwork over six (6) square feet in cross sectional area supported more than 12" from structure.
- 3.05** All air terminals that weight more than 75 pounds shall have a safety chain or safety cable in addition to its other support.
- 3.06** Air handling units, boilers, pumps and fans shall be bolted to the housekeeping pads in accordance with Paragraph 3.01.
- 3.07** Powder-activated fasteners (shot pins) shall not be used for anchorage.
- 3.08** Vibration isolators shall have a bumper restraint in each horizontal direction, and vertical

restraints shall be provided where required to resist overturning.

- 3.09** Oversized plate washers extending to the equipment wall shall be used at bolted connections through the base sheet metal if the base is not reinforced with stiffeners or not capable of transferring the required loads.

END OF SECTION 23 05 48

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-23 sections.
- B. Type of identification devices specified in this section include the following:
 - Plastic Pipe Markers.
 - Valve Tags.
 - Valve Schedule Frames.
 - Engraved Plastic-Laminate Signs.
 - Ceiling Tacks.
- C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of the equipment assembly in other Division-23 sections.

1.02 RELATED SECTIONS

- A. Section 23 23 00 – Refrigerant and Humidity Drain Piping.
- B. Section 23 34 23 – HVAC Power Ventilators.
- C. Section 23 62 13 – Air Cooled Outdoor Heat Pump Units.
- D. Section 23 81 27 – Split System Air Handling Units with Coils.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of identification devices of types and sizes required.
- B. ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

1.04 SUBMITTALS

- A. Product Data: Submit product specifications and installation instructions for each identification material and device desired.
- B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.
- C. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 1.

PART 2 - PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

- A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-21 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.
- B. Plastic Pipe Markers:
 - 1. General: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, color-coded, plastic-sheet pipe markers, complying with ANSI A13.1.
 - a. Small Pipes: For external diameters less than 6 inches (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - (1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - (2) Adhesive lap joint in pipe marker overlap.
 - b. Large Pipes: For external diameters of 6 inches and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
 - (1) Laminated or bonded application of pipe marker to pipe (or insulation)
 - (2) Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.
 - c. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
 - d. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
 - 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.
- C. Valve Tags:
 - 1. At the Contractor's option, provide one of the following:
 - a. Brass Valve Tags: provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch diameter tags, except as otherwise indicated.
 - b. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32 inch thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4 inch high letters and sequenced valve numbers 1/2 inch high, and with 5/32 inch hole for fastener. Provide 1-1/2 inch square black tags with white lettering, except as otherwise indicated.
 - 2. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- D. Valve Schedule Frames:
 - 1. General: For each page of the valve schedule, provide a glazed display

frame, with screws for removable mounting on walls. Provide frames of rigid plastic or metal, with plastic glazing.

- E. Engraved Plastic-Laminate Signs:
 - 1. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 - 2. Thickness: 1/16 inch for units up to 20 square inches or 8 inch length; 1/8 inch for larger units.
 - 3. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plastic pipe markers which may be incorporated in the work include, but are not limited to, the following:
Seton Name Plate Company
EMED Co., Inc.
Kolbi Pipe Marker Co.
Approved equal.

2.02 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/ maintenance of mechanical systems and equipment.
- B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
 - 1. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. Ductwork Identification:
 - 1. General: Identify air supply, return, exhaust, intake and relief ductwork with plastic signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).
 - 2. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50' spacing along exposed areas.
 - 3. Access Doors: Provide plastic-laminate type signs on each access door in

- ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
4. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.
- C. Piping System Identification:
1. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, (shafts, tunnels, plenums), exterior non-concealed locations and above removable acoustical ceilings.
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
 - c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 - d. At access doors, manholes and similar access points which permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced intermittently at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings.
- D. Valve Identification:
1. General: Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
 2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
 - a. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than signet machine room.
- E. Mechanical Equipment Identification:
1. General: Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Pumps and similar motor-driven units.
 - c. Fans, blowers, primary balancing dampers and mixing boxes.
 - d. Central-station units.
 - e. Tanks and pressure vessels.
 - f. Motor starters and other control equipment.
- F. Refer to Division-23 sections for identification requirements at central-station

mechanical control center; not work of this section.

- G. Refer to Division-26 sections for identification requirements of electrical work; not work of this section.
- H. Lettering Size: Minimum 3/8 inch high lettering for name of unity where viewing distance is less than 2'-0"; 3/4 inch high for distances up to 6'-0"; and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 the size of principal lettering.
- I. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, and warn of hazards and improper operations.
- J. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

END OF SECTION 23 05 53

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for Testing, Adjusting, and Balancing of Heating, Ventilating, and Air Conditioning Systems.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating and Air Conditioning.
- B. Section 23 09 33 – Electric and Electronic Control System for HVAC
- C. Section 23 31 00 – HVAC Ducts and Casings.
- D. Section 23 34 23 – HVAC Power Ventilators.
- E. Section 23 62 13 – Air Cooled Outdoor Heat Pump Units.
- F. Section 23 81 27 – Split System Air Handling Units with Coils.

1.03 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. ASHRAE - 2007 Systems Handbook: Chapter 37, Testing, Adjusting and Balancing.
- C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.04 SUBMITTALS

- A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
- B. Submit test reports as a submittal under provisions of Section 01 30 00 and Section 23 05 00.
- C. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.
- D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- E. Provide reports in hard back, letter size manuals, complete with index page and indexing tabs, with cover identification at front and side.
- F. Include detailed procedures, agenda, sample report forms prior to commencing system balance.

1.05 QUALITY ASSURANCE

- A. Mechanical contractor may at his option perform hydrostatic pressure test and hydronic balancing of the HVAC piping systems.
- B. Air Balance Subcontractor shall be a qualified representative of the Air Distribution Manufacturer whose devices are used on the project, or a qualified Independent Balancing Contractor. Air Balance Subcontractor may not be the Mechanical Contractor or the Sheet Metal Contractor on the project.
- C. In order to be considered qualified, the Air Distribution Manufacturer shall include with air device shop drawings evidence of qualifications as follows:
 - 1. Resume of Air Balance Technician(s) to be used on the project including list of major air balance projects.
 - 2. Resume of firm's experience in air balance and list of air balance projects.
 - 3. Evidence of certification of calibration of equipment.
- D. In order to be considered to be qualified, Independent Air Balance Contractor shall submit evidence of qualifications as follows:
 - 1. Resume of firm's experience in air balance representing as an Air Balance Contractor. Resume shall include a list of air balance projects.
 - 2. Resume of Air Balance Technicians(s) to be used on the project, including list of major air balance projects.
 - 3. Evidence of certification of calibration or equipment.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence work under the provisions of Division 01.
- B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- C. Schedule and provide assistance in final adjustment and test of life safety, smoke evacuation and/or smoke control system with Fire Authority.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. All measurements during air balance operations shall be made by means of the "Velometer" or "Anemometer" method. Instruments used for check of air quantities shall have recent certification of calibration.
- B. The Air Balance Subcontractor shall furnish balance forms for all air systems. Forms shall list air distribution devices by location, system, size, pattern, CFM flow factor and required velocity.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before commencing work, verify that systems are complete and operable. Ensure the following:
 - 1. Equipment is operable and 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. Correct fan rotation.
 - 7. Fire and volume dampers are in place and open.
 - 8. Coil fins have been 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 has been minimized.
 - 12. Service and balance valves are open.
- B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.
 - C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
 - D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

3.02 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES

- A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.
- B. Adjust hydronic systems to plus or minus 10 percent of design conditions indicated.

3.04 ADJUSTING

- A. Recorded data shall represent actually measured, or observed condition.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.05 AIR BALANCE PROCEDURE

- A. All air quantities shall, after completion of the job, be adjusted to provide air quantities shown on plans. After complete adjustment, additional re-adjustment shall be performed if necessary to satisfy desired temperature.
- B. The balance procedure shall include the checking of each supply, return and exhaust fan. As a minimum, CFM, RPM and ampere readings shall be taken. Pulley adjustments, etc., shall be performed to obtain the required CFM readings.

- C. Air Balance Subcontractor shall also furnish all balancing instruments required. Air Balance Subcontractor shall provide one experienced technician to team with Contractor's technician to balance system. The Air Balance Subcontractor's Technician and the Contractor's Technician shall perform as a team during the entire field balancing operation.
- D. After all adjustments and corrections have been performed to balance system as designed and required, the Air Balance Subcontractor shall prepare and submit three (3) copies of completed balance form to Architect/Engineer for approval.
- E. At the time of balancing, the Air Balance Contractor's Technician shall verify that each device is the size and pattern submitted and includes accessories such as volume controls and deflectrols where specified.

3.06 SYSTEM OPERATING TEST

- A. After the successful completion of all equipment start-up and individual item test requirements, formal tests shall be performed on the complete Mechanical systems, measurements shall be made and reports prepared as specified below. 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. Submit for the Architect's approval the form on which the measurements specified herein. Furnish all required record forms. Submit for the Architect's approval, complete shop drawings or catalog data for all instruments to be used for the final operating test, and obtain approval at least two weeks before the forms and instruments will be required. Sample forms can be provided by the Architect if the Contractor requests.
- B. First operating test by Contractor: Prove the operation of the Mechanical systems and of each individual item in the systems. At least 10 days' notice shall be given the Architect of such tests. Should any item of the systems fail to perform in an approved manner, this test shall be repeated until the operating test is approved by the Architect. During this test, balance circulation of steam, condensate, heating and chilled water, air and all other fluids conveyed to provide proper quantities to all items of equipment. Adjust and set all balancing cocks, valves, dampers and similar items to ensure that the systems perform as intended.
- C. Checking by Owner and Architect: Following the successful completion of first operating tests by the Contractor, the Owner and Architect shall have the privilege of making such tests as they may desire during a period of three weeks to ascertain if any corrections are to be made to the system. At the end of the testing by the Owner and Architect, the Architect shall direct the Contractor in writing to make such corrections to the systems as are within the Scope of the contract.
- D. Contractor's corrections to systems: Make all required corrections to the systems and notify the Architect in writing that the corrections outlined have been completed and give at least seven days' notice of a final operating test.
- E. A final operating test shall then be performed by the Contractor to the satisfaction of the Architect for a period of three days. Should any element of the systems not perform properly, the Contractor shall make all required corrections, and the test shall be repeated until successfully performed.
- F. Measurements: Make the following measurements during the final operating test.
 - 1. Electrical: Running ampere and voltage of each motor 3/4HP or larger.
 - 2. Air pressures at entrance and exit of each electronic air cleaner, filter, coil, fan and damper.

3. Air temperatures in each heated or air-conditioned space, at the entrance and exit of each coil, downstream from each pair of dampers where air of two different temperatures is mixed and outside the structure.
 4. Relative humidity at location of each humidity sensor.
 5. Domestic hot water supply temperature at the fixtures closest to and farthest away from the domestic hot water heater on each system.
 6. Static pressure of cold-water line at building service connection.
- G. Report: Four copies of a written report of the operating test, on the approved form of record, shall be submitted to the Architect for approval and subsequent transmittal to the Owner.

END OF SECTION 23 05 93

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for Duct Insulation for HVAC Systems.

1.02 RELATED SECTIONS

- A. Section 23 31 00 – HVAC Ducts and Casings.

1.03 REFERENCES

- A. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- B. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM E96 - Water Vapor Transmission of Materials.
- D. NFPA 255 - Surface Burning Characteristics of Building Materials.
- E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.04 SUBMITTALS

- A. Submit under provisions of Division 01 and Section 23 05 00.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/100 in accordance with NFPA 255.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 23 05 00.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 - PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553 and C612; flexible, noncombustible blanket.
 - 1. "K" value: 0.27 at 75 degrees F.
 - 2. Maximum service temperature: 250 degrees F.
 - 3. Maximum moisture absorption: 0.20 percent by volume.
 - 4. Density: 1.0 lb/cu ft.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture vapor transmission: 0.04 perm.
 - 3. Secure with adhesive and tape.
- C. Vapor Barrier Tape
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

2.02 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. "K" value: 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 350 degrees F.
 - 3. Maximum moisture absorption: 0.20 percent by volume.
 - 4. Density: 4.2 lb/cu ft.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture vapor transmission: 0.04 perm.
 - 3. Secure with adhesive tape.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

2.03 GLASS FIBER DUCT LINER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, bonded fibers, noncombustible blanket with edge coating.
 - 1. "K" value: 0.26 at 75 degrees F.
 - 2. Maximum service temperature: 250 degrees F.
 - 3. Density: 1.5 lb/cu ft.
- B. Adhesive:
 - 1. Waterproof, fire-retardant type.
- C. Liner Fasteners: Galvanized steel, impact applied or welded with press on head conforming to Mechanical Fastener Standard MF-19/1.

2.05 APPROVED MANUFACTURERS

- A. Glass Fiber, Flexible:
 - 1. Owens Corning Fiberglass, Type 100.
 - 2. Johns Manville.
 - 3. Knauf.
 - 4. Architect Approved.
- B. Glass Fiber, Rigid:
 - 1. Owens Corning Fiberglass, Type 704.
 - 2. Johns Manville.
 - 3. Knauf.
 - 4. Architect Approved.
- C. Glass Fiber Duct Liner, Adjustable:
 - 1. CertainTeed ToughGard 150.
 - 2. Johns Manville.
 - 3. Knauf.
 - 4. Architect Approved.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that ductwork has been tested and joints and seams sealed, before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Insulated ductwork conveying air below or above 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.
- C. Grease Duct
 - 1. Apply two layers of FlameChek insulation with all seams and joints over lapped by 3 inches.
 - 2. Off-set the longitudinal joint on the second layer by 10.5" from the first layer.
 - 3. Secure the insulation to the duct using tape, SS bands, and insulation pins.
 - 4. Follow all manufactures installation requirements for the installation of the insulation, transitions, hangers, access doors, and thru-penetrations.
- D. Ducts external to the building shall be externally insulated with 2" thick rigid glass fiber insulation, cover with minimum .016" thick aluminum jacketing with waterproof seams. Crown jacketing as required to shed water and seal. A covering equal to "Alumaguard" may be used in lieu of aluminum jacket.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal

conditions, as materials indicated.

3.04 FLEXIBLE GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS
All supply, return, and outside air ducts inside the building, unless noted otherwise.	2 inches

3.05 RIGID GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS
All ductwork external to the building (See Section 3.02, Paragraph D)	2 inches
All rectangular ductwork in Mechanical Rooms Provide canvas jacket.	2 inches

3.06 FLEXIBLE GLASS FIBER DUCT LINER INSULATION SCHEDULE

DUCTWORK	THICKNESS
All supply and return ductwork shown crosshatched or with dashed lines on the Drawings	1 inch

END OF SECTION 23 07 13

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for Piping Insulation for Heating, Ventilating, and Air Conditioning systems.

1.02 RELATED SECTIONS

- A. Section 23 23 00 – Refrigerant and Humidity Drain Piping.

1.03 REFERENCES

- A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- F. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- H. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- I. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- J. ASTM E96 - Water Vapor Transmission of Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Division 01 and Section 23 05 00.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/100 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 23 05 00.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 - PRODUCTS

2.01 GLASS FIBER

- A. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. "K" value: ASTM C335, 0.24 at 75 degrees F.
 - 2. Minimum Service Temperature: -20 degrees F.
 - 3. Maximum Service Temperature: 850 degrees F.
 - 4. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket:
 - 1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
 - 3. Secure with adhesive applied to longitudinal laps and butt strips.
 - 4. Secure with vapor barrier mastic.
 - 5. Self-sealing laps may be used provided lap seal is additionally sealed with vapor barrier masters.

2.02 CELLULAR FOAM

- A. Insulation: SASTM C534; flexible, cellular elastomeric, tubing.
 - 1. "K" Value: ASTM C177 C518; 0.27 at 75 degrees F.
 - 2. Minimum Service Temperature: -40 degrees F.
 - 3. Maximum Service Temperature: 220 degrees F.
 - 4. sheet by volume.
 - 5. Moisture Vapor Transmission: ASTM E96, 0.20 perm inches.
 - 6. Maximum Flame Spread: ASTM E84; 25.
 - 7. Maximum Smoke Developed: ASTM E84; 25
 - 8. Connection: Waterproof vapor barrier adhesive.

2.03 APPROVED MANUFACTURERS

- A. Glass Fiber:
 - 1. Owens/Corning Fiberglass.
 - 2. Johns Manville.
 - 3. Knauf.
 - 4. Architect Approved - Other acceptable manufacturers offering equivalent products.
- B. Vapor Barrier Jacket Lap Adhesive - Compatible with insulation:
 - 1. Foster 25.

2. Childers.
 3. Architect Approved.
- C. Cellular Foam:
1. Armstrong-Armaflex - FR.
 2. Owens Corning.
 3. K-flex.
 4. Architect Approved.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. On exposed piping, locate insulation and cover seams in least visible locations.
- C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory applied or field applied.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
 3. Finish with glass cloth and vapor barrier adhesive.
 4. PVC fitting covers may be used.
 5. Continue insulation through walls, sleeves, pipe hangers, and other pipe.
 6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. For insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 3. Finish with glass cloth and adhesive.
 4. PVC fitting covers may be used.
 5. 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.
 6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- E. Inserts and Shields:
 1. Application: Piping 1-1/2 inches diameter or larger.
 2. Insert Location: Between support shield and piping and under the finish jacket.
 3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- F. Finish insulation at supports, protrusions, and interruptions.
- G. For 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 or stainless-steel jacket with seams located on bottom side of horizontal piping.

- H. For 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.
- I. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- J. Valves and fittings insulated with block insulation shall be finished with insulating cement and troweled to a smooth and uniform finish.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

	PIPING SYSTEMS	THICKNESS
A.	Humidity Drain Piping Provide aluminum jacket on exterior piping.	½ inch

3.05 CELLULAR FOAM

	PIPING SYSTEM	THICKNESS
A.	Refrigerant Piping Exterior piping to receive two coats of weather protectant paint.	1" Thick (see H above)

END OF SECTION 23 07 19

ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC**PART 1 - GENERAL****1.01 SCOPE**

- A. Low voltage electric controls system.
- B. Includes:
 - 1. This section includes but is not necessarily limited to the automatic control of heating, ventilating and air conditioning equipment as follows:
 - a. Air cooled outdoor condensing units.
 - b. Split system air handling units with coils.
 - c. Exhaust fans.
 - 2. Conduit shall be furnished by the Electrical Contractor.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating and Air Conditioning.
- B. Section 23 05 13 – Common Electrical Requirements for HVAC Equipment.
- C. Division 26 – All Sections.

1.03 COORDINATION

- A. All power and motor and line voltage interlock wiring shall be done by the electrical contractor unless otherwise noted for specific items.
- B. The Electrical contractor shall furnish and install all conduit and back boxes for controls and interlock wiring.
- C. Low voltage control and interlock wiring shall be done by the Mechanical contractor. Motors shall be as shown on the drawings.
- D. The mechanical contractor shall furnish and install any low voltage relays, thermostats and similar items required for the proper operation of the mechanical equipment.
- E. The mechanical contractor shall coordinate exact requirements with the Electrical Contractor.

1.04 SUBMITTALS

- A. The contractor shall submit complete temperature control diagrams with written "sequence of operation" and factory printed specification data sheets, covering each control device proposed to be used for review prior to installation of any equipment or part of the system. Diagrams shall contain a Bill of Materials list for each device used.

- B. Submittals shall show complete piping diagrams (part designations) and terminal-to-terminal wiring diagrams of all control and interlock wiring furnished under this specification.
- C. Submittal shall include a schematic one-line riser diagram noting conduit sizes and number of conductors contained therein for approval.

1.05 QUALITY ASSURANCE

- A. Wiring:
 - 1. The wiring and conduit system for the control and operation of the mechanical system items shall comprise a unitary separate wiring system. The installation of this wiring system shall be governed by Division 26 - ELECTRICAL.
 - 2. Control system wiring shall not be run in conduit installed for power wiring by Division 26 - ELECTRICAL, without direct approval of the Architect.
- B. Control system shall consist of all thermostats, temperature sensors, controllers, automatic valves, damper operators, control panels, controls and interlock wiring to fill the intent of the specifications and provide for a complete and operable system.

1.06 INSTRUCTION TO OWNER'S REPRESENTATIVES

- A. Upon completion of the work, the contractor shall instruct operating personnel in use and programming of each control system. Owner shall be furnished two (2) copies of reference control system brochure covering equipment control diagrams and sequence of operation, in addition to framed schematics, located where directed by the Architect, of the control system and sequence of operation.

PART 2 - PRODUCTS

2.01 THERMOSTATS

- A. Thermostats shall be programmable low voltage.
- B. Thermostats shall be two stage heating and cooling, as shown on the plans.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall be responsible for the control and interlock wiring associated with the air conditioning system. Coordinate location, power requirements, conduit runs, etc. with the Electrical Contractor.
- B. Furnish and install all low voltage wiring between thermostats and controlled equipment. Number of wires and wire gauge shall be as recommended by the equipment manufacturer for this specific application.

- C. Minimum size for line voltage wiring (over 24-volts) shall be No. 14 TW or RH. Minimum size on 24-volt and under wiring shall be No. 16 TW or RH. All wiring shall be in accordance with the National Electrical Code for current carrying capacity.
- D. Interlock controls shall be made through auxiliary contacts with pairs of conductors. Cross-phasing or single wire interlocking will not be acceptable.
- E. Provide all necessary boxes, fittings and accessories as required.
- F. Do not run conduit concealed under insulation or inside ducts. Mount control devices and conduit located on ducts or apparatus with external insulation on stand-off support to avoid interference with insulation.
- G. Run wire connecting devices on or in control cabinet parallel with the sides of the cabinet neatly racked to permit tracing. Rack connections bridging a cabinet door along the hinge side and protect from damage. Provide grommets, sleeves or vinyl tape to protect wires from sharp edges of panels, conduit and other items.

3.02 SEQUENCE OF OPERATION

- A. Refer to plans for sequences of operation.

END OF SECTION 23 09 33

REFRIGERANT AND HUMIDITY DRAIN PIPING**PART 1 - GENERAL****1.01 SCOPE**

- A. Interconnecting piping between evaporator coil and condensing unit on split system packaged units and ventilation air units.
- B. Condensate (Humidity) drain piping.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Common Work Results for HVAC - Section 23 05 00.
- B. HVAC Piping Insulation - Section 23 07 19.

PART 2 - PRODUCTS**2.01 PIPING:**

- A. Type "L", hard drawn copper (degreased) - Refrigerant.
- B. Type "M", hard drawn copper – Condensate Drain.

2.02 FITTINGS

- A. Wrought copper.

2.03 SOLDER

- A. Brazing alloy with 1000 degrees F melting point and suitable flux.

2.04 VALVES

- A. Packless bellows or diaphragm type for use with Freon type refrigerant.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.
- D. Provide clearance for installation of insulation, and access to valves and fittings.
- E. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain

top of pipe level.

- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Install refrigerant accessories as shown on the drawings and as may be recommended by the unit manufacturer.
- I. Provide double suction risers and pitch lines as required to insure positive oil return to compressor.
- J. Testing shall be done during progress of work or at completion to insure tight system. Charge the system with dry nitrogen and soap test hot gas lines at 300 psi and liquid and suction lines at 245 psi. Allow system to stand for 24 hours under pressure and if no change in pressure, system may be considered tight.
- K. Before charging, evacuate the system to 0.15 inches of mercury absolute pressure. All pumps to operate at least four (4) hours at this reading.
- L. Install condensate drain piping with traps per details on the drawings. Supports on roof shall be portable pipe hanger Model PP10 with roller

3.02 COPPER PIPE CONNECTIONS

- A. Form hot brazed joints in copper, brass, or bronze fittings with lead-free solder.
- B. Make connections to equipment and branch mains with unions.
- C. Provide adapters in lines for valves and equipment. Bushings are not acceptable.

3.03 REFRIGERANT CONTAINMENT

- A. Contractor shall take all necessary precautions to prevent the accidental or intentional release of refrigerant to the atmosphere.
- B. When a sealed system must be broken, provide all necessary equipment and containers as required to pump down the entire system volume, or that volume not contained in isolated receivers on the equipment.
- C. Contractor shall clean and re-use refrigerant to the greatest extent possible. Un-used refrigerant shall be properly disposed of or recycled at the contractor's expense.

END OF SECTION 23 23 00

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for HVAC Ducts and Casings.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating, and Air Conditioning System.
- B. Section 23 05 93 – Testing, Adjusting and Balancing.
- C. Section 23 07 13 – Duct Insulation.

1.03 QUALITY ASSURANCE

- A. Installer: A firm with successful installation experience on projects with low pressure ductwork systems work similar to that required for project.
- B. SMACNA Standards: Comply with SMACNA HVAC Duct Construction Standards for fabrication and installation of low-pressure ductwork.
- C. NFPA Compliance: Comply with ANSI/NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems" and ANSI/NFPA 90B "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems" and ANSI/NFPA96 "Standard for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".
- D. Field Reference Manual: Have available at project field office, copy of "SMACNA HVAC Duct Construction Standards", latest Edition.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications on manufactured products and factory-fabricated ductwork, used for work of this section.
- B. Record Drawings: At project closeout, submit record drawings of installed ductwork, duct accessories, and outlets and inlets, in accordance with requirements of Division 01.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.
- B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.01 LOW PRESSURE DUCTS

A. DUCTWORK MATERIALS

1. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.
2. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lock forming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.
3. Duct sizes shown on drawings are required free area sizes and do not account for internal liner thickness.

B. MISCELLANEOUS DUCTWORK MATERIALS

1. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
2. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Hardcast tape or approved equal.
3. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
 - a. Except where space is indicated as "High Humidity" area, interior support materials of not less than 1/4" diameter or 3/16" thickness may be plain (not galvanized).

C. FLEXIBLE DUCT

1. Flexible duct may be used in lengths not over 3'-0" to connect ceiling diffusers. Flexible duct shall not be used to turn elbows in excess of 45 degrees.
2. Flexible duct shall meet U.L. 181 and conform to NFPA 90A and 90B and be installed in accordance with the conditions of their listing by U.L. as a flexible duct.
3. Installation shall conform to SMACNA "HVAC Duct Construction Standards", Section III, latest edition.

D. FABRICATION

1. Shop fabricate ductwork in 4, 8, 10 or 12-foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
2. Shop fabricated ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards", First Edition, 1985.
3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with centerline radius equal to associated duct width; and fabricate to including turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degree for contracting tapers and 20 degrees for expanding tapers. The contractor may use square 90 degree elbows with turning vanes in lieu of centerline radius turns.
4. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-23 section "Air Duct Accessories" for accessory requirements.

E. **FACTORY-FABRICATED DUCTWORK**

1. General: As installer's option, provide factory- fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
2. Material: Galvanized sheet steel complying with ANSI/ASTM A 527, lock-forming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized.
3. Gauge: 26 ga. minimum for round ducts and fittings, 4 inch through 24 inch diameter.
4. Elbows: One piece construction for 90 degree and 45 degree elbows 14 inches and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
5. Divided Flow Fittings: 90 degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.
6. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory-fabricated ductwork which may be incorporated in the work include, but are not limited to, the following:

United Sheet Metal Div., United McGill Corp.
Semco Manufacturing, Inc.
Sheet Metal Products, Inc.

PART 3 - EXECUTION

3.01 LOW PRESSURE DUCTWORK

A. **INSTALLATION OF DUCTWORK**

1. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (1% leakage) and noiseless (no objectional noise) systems, capable for performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.
2. Seal ductwork, to class recommended, and method prescribed in SMACNA "HVAC Duct Construction Standards", latest edition.
3. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
4. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details, and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct unusable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent- enclosure elements of building. Limit clearances to 1/2 inch where furring is shown for enclosure of concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1 inch clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work. Do not locate ductwork over (parallel to) position indicated to extend to deck.
5. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.
6. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus-insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.
7. Provide insulated blank-off plates as indicated on the drawings where ducts connect

- to vents or louvers.
8. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
 9. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards", latest Edition.
 10. Do not reroute or shorten branch ductwork to terminal or inline air devices without direct approval of design Engineer. Routings and offsets are designed to be in compliance with cross sectional area and distance from penetration through fire rated wall. Any changes must be in direct compliance with Section 510 of the Standard Mechanical Code, 1991 Edition.
 11. All underground joints shall be gasket and sealed with screws or clamps per manufacturer's instructions.
 12. All underground duct shall be installed in accordance with the requirements of the State Building Code.
 - a. Saddles shall be cured in outside air and not permitted in otherwise publicly within the first two hours in occupied spaces.
 - b. No piping grounding needed.
- B. CLEANING AND PROTECTION
1. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
 2. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.
- C. BALANCING
1. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 23 31 00

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for Air Duct Accessories for complete Heating, Ventilating, and Air Conditioning Systems.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating, and Air Conditioning Controls.
- B. Section 23 05 93 – Testing, Adjusting and Balancing.
- C. Section 23 31 00 – HVAC Ducts and Casings.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of duct accessories, of types and sizes required, whose products have been in satisfactory use in similar service.
- B. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) high pressure and low pressure duct construction standards.
- C. Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.
- D. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".
- E. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data for each type of duct construction; and installation instructions.
- B. Shop Drawings: Submit assembly-type shop drawings for each type of duct assembly showing interfacing requirements with ductwork, and method of fastening or support.
- C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory, include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.01 DAMPERS

- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "Low Pressure Duct Standards".
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering

dampers which may be incorporated in the work include, but are not limited to, the following:

Air Balance, Inc.
Airguide Corp.
Airstream Products Div., Penn Ventilator Co., Inc.
American Warming & Ventilating, Inc.
Arrow Louver and Damper Corp.
Elgo Shutter and Mfg. Co.
Imperial Damper and Louver Co., Inc.
Louvers & Dampers.
Ruskin Mfg. Co.

2.02 TURNING VANES

- A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "Low Pressure Duct Standards".
- B. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2 inch wide curved blades set at 1-1/2 inch o.c., supported with bars perpendicular to blades set at 2 inches o.c., and set into side strips suitable for mounting in ductwork, per SMACNA Standards for low pressure duct.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering turning vanes which may be incorporated in the work include, but are not limited to, the following:

Air Filter Corp.
Anemostat Products Div., Dynamics Corp. of America
Duro-Dyne Corp.
Environmental Elements Corp., Subs. Koppers Co., Inc.
Tuttle & Bailey Div. of Interpace Corp.

2.03 DUCT HARDWARE

- A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
 - 1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
 - 2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12 inches. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct hardware which may be incorporated in the work include, but are not limited to, the following:

Ventfabrics, Inc.
Young Regulator Co.
Duro Dyne

2.04 DUCT ACCESS DOORS

- A. General: Provide, where indicated and at all fire and smoke dampers, duct access doors of size indicated.
- B. Construction: Construct of same or greater gage as ductwork served, provide double panel insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with 1 handle-type latch for doors 12 inches high and smaller, 2 handle-type latches for larger doors.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access doors which may be incorporated in the work include, but are not limited to, the following:

Air Balance Inc.
Duro Dyne Corp.
Register & Grille Mfg. Co., Inc.
Ruskin Mfg. Co.
Semco
Ventfabrics, Inc.
Zurn Industries, Inc., Air Systems Div.

2.05 FLEXIBLE CONNECTIONS

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which duct accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 degree elbows in supply.
- C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- D. Coordinate with other work, including ductwork, as necessary to interface installation of duct accessories properly with other work.
- E. Field Quality Control: Operate installed duct accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leak proof performance.

END OF SECTION 23 33 00

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for HVAC Power Ventilators.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating, and Air Conditioning Systems.
- B. Section 23 31 00 – HVAC Ducts and Casings.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of power ventilators and exhaust fans, of types and sizes required, whose products have been in satisfactory use in similar service.
- B. AMCA Compliance: Provide power roof ventilators and exhaust fans bearing the Air Movement and Control Association, Inc. (AMCA) Certified Ratings Seal.
- C. UL Compliance: Provide power roof ventilator and exhaust fans electrical components which have been listed and labeled by Underwriters Laboratories (UL).

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data for power ventilators and exhaust fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.
- B. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.

PART 2 - PRODUCTS

2.01 DIRECT DRIVE DELUXE CEILING MOUNTED CENTRIFUGAL EXHAUST FANS

- A. General Description:
 - 1. Base fan performance at standard conditions (density 0.075 Lb/ft³)
 - 2. Ceiling mounted applications
 - 3. Performance capabilities up to 200 cubic feet per minute (cfm) and static pressure to 0.75 inches of water gauge
 - 4. Fans are available in nineteen sizes (50 - 200-unit sizes)
 - 5. Maximum operating temperatures is 130 Fahrenheit (54.4 Celsius)
 - 6. Sound levels as low as 1.7 AMCA sones
 - 7. UL/cUL listed for above bathtub exhaust
 - 8. Fans are UL/cUL listed 507 - Electric Fans
 - 9. Each fan shall bear a permanently affixed manufacture's nameplate containing the model number and individual serial number
- B. Wheel:

1. Forward curved centrifugal wheel
 2. Constructed of calcium carbonate filled polypropylene
 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
- C. Motors:
1. Motor enclosures shall be open drip-proof (ODP), opening in the frame body and or end brackets
 2. Motors are permanently lubricated sleeve bearing type to match with the fan load and furnished at the specific voltage and phase
 3. Motors shall be mounted on vibration isolators and be accessible for maintenance
 4. Compatible for use with speed controls
 5. Thermal overload protection
- D. Housing:
1. Constructed of heavy gauge galvanized steel
 2. Profile as low as 6 15/16 inches
- E. Aluminum Backdraft Damper:
1. Prevents air from entering back into the building when fan is off
 2. Eliminates rattling or unwanted backdrafts
- F. Outlet:
1. Steel duct collar shall be six or four inches in diameter to accept a six- or four-inch round duct work.
 2. Shall include a backdraft damper
- G. Grille:
1. Types: Aluminum
 2. Constructed of high impact polystyrene plastic shall be factory standard on all units
 3. Attached to the housing with screws
- H. Mounting Brackets:
1. Fully adjustable for multiple installation conditions
- I. Options/Accessories:
1. Disconnect Switches:
 - a. NEMA rated: 1
 - b. Positive electrical shut-off
 - c. Access for wiring shall be external
 2. Speed Controls:
 - a. Controls the fan's output
 - b. Fan can be adjusted to 60 percent of full speed
 - c. Can be used to operate more than one fan at a time
 3. Wall Discharge:
 4. Type: Round Connection, hooded wall cap model WC
 5. Vibration Kit:
 - a. Available for suspended installations
 - b. Includes pre-punched hole for ease of installation and shall have all hardware to mount one unit.

2.02 DIRECT DRIVE INLINE FANS

A. General Description:

1. Base fan performance at standard conditions (density 0.075 Lb/ft³)
 2. Performance capabilities up to 27,800 cubic feet per minute (cfm) and static pressure to 3.0 inches of water gauge
 3. Fans are available in twenty-four sizes with nominal wheel diameters ranging from 7 inches through 33 inches
 4. Continuous operating temperature range of -10° Fahrenheit (-23.3° Celsius) to 130° Fahrenheit (54.4° Celsius)
 5. Applications include: supply, exhaust, return, or make-up air systems
 6. UL-705 certified for indoor (standard) and outdoor applications (must configure fan for outdoor use to allow outdoor installation)
 7. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number
- B. Wheel:
1. Constructed of aluminum.
 2. Wheel type to be non-overloading, backward inclined centrifugal wheel.
 2. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 3. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.
 4. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.
- C. Motor:
1. Electronically Commutated Motor
 - a. Motor enclosures: Open Drip Proof
 - b. Electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
 - c. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
 - d. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor or integrated variable frequency drive.
 - e. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
 - f. Motors can achieve up to 95% efficiency, model and horsepower dependent.
- D. Housing/Cabinet Construction:
1. Construction material: Galvanized
 2. Square design constructed of heavy gauge galvanized steel, aluminum or painted steel
- E. Inlet Cone:
1. Construction material: Galvanized

- F. Housing Supports and Drive Frame:
 - 1. Drive Frame is constructed of structural steel with formed flanges.
- G. Disconnect Switch:
 - 1. NEMA Rated: 1
 - 2. Positive electrical shut-off
 - 3. Wired from fan motor to junction box
- H. Duct Collar:
 - 1. Square Duct Mounting Collar
 - a. Inlet and discharge collars provide easy slip fit duct connection
 - b. Square design to provide a large discharge area
- I. Access Panel:
 - 1. Two sided access panels, permit easy access to all internal components
 - 2. Located perpendicular to the motor mounting panel
- J. Options/Accessories:
 - 1. Damper:
 - a. Type: Gravity
 - b. Galvanized frames with prepunched mounting holes
 - c. Balanced for minimal resistance to flow
 - 2. Finishes:
 - a. Coating: Permatector
 - 3. Inlet and Outlet Guards:
 - a. Metal construction to provide protection for non-ducted installations
 - 4. Insulated Housing
 - a. Thickness: 1 inch
 - b. For noise reduction and condensation control
 - c. Constructed of fiberglass liner
 - 5. Isolation:
 - a. Type: Housed Spring
 - b. Sized to match the weight of each fan
 - 6. Motor Cover:
 - a. Constructed of galvanized steel
 - b. Covers motor and drives for safety
 - c. Standard on unit specified with UL and ODP motor enclosures
 - 7. Pressure Probe:
 - a. 1/4 inch diameter tube in fan venturi that allows hook up to manometer
 - 8. Wiring Pigtail:
 - a. Direct hook-up to the power supply

2.03 APPROVED MANUFACTURERS

- A. Ceiling-Mounted and Inline Fans:
 - 1. Greenheck.
 - 2. Cook.

3. ACME.
4. Architect Approved.

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine areas and conditions under which power ventilators and exhaust fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF POWER VENTILATORS

- A. General: Except as otherwise indicated or specified, install ventilators and exhaust fans in accordance with manufacturer's installation instructions and recognized industry practices to ensure that ventilators serve their intended function.
- B. Coordinate ventilator and exhaust fan work with work of roofing, walls, and ceilings, as necessary for proper interfacing.
- C. Ensure that power ventilators and exhaust fans are wired properly, with correct motor rotation, and positive electrical motor grounding.
- D. Remove shipping bolts and temporary supports within ventilators and exhaust fans. Adjust dampers for free operation.

3.03 TESTING

- A. General: After installation of ventilators and exhaust fans has been completed, test each to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.04 SPARE PARTS

- A. General: Furnish to Owner, with receipt, 1 spare set of belts for each belt drive power ventilator and exhaust fans.

END OF SECTION 23 34 23

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Basic Requirements for Air Inlets and Outlets.

1.02 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Results for Heating, Ventilating, and Air Conditioning System.
- B. Section 23 05 93 – Testing, Adjusting and Balancing.
- C. Section 23 31 00 – HVAC Ducts and Casings.

1.03 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- C. ARI 650 - Air Outlets and Inlets.
- D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- E. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Air distribution devices have been specifically selected based on the specified manufacturer's performance data. If the Contractor submits on devices other than those specified, the submittal must include an item-by-item selection of substitutions listed by space location.
- C. Where compliance with performance requires different dimensions, such as neck or face size, than the specified item, the submittal must note where these dimension changes occur listing both the original and the new dimensions.
- D. Any additional costs by any trade resultant from air device substitution shall be borne by the Contractor.

1.05 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

- A. Submit product data under provisions of Division 01 and Section 23 05 00.
- B. Submit schedule of air devices indicating type, size, location, and application.

- C. Schedule must include model number, size, air pattern, CFM, pressure drop, throw, NC noise level, finish and mounting method for both the submitted and specified device.
- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.
- E. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.01 AIR DEVICES

- A. All air devices shall be equal to products scheduled on the Drawings.

2.02 LOUVERS (ALUMINUM)

- A. Frame shall be 6 inch deep channel of .081 inch thick 6063-T5 extruded aluminum alloy.
- B. Blades shall be constructed of .081 inch thick aluminum. Blades shall be adjustable and drainable.
- C. Insect screen shall be aluminum mesh, removable type. Screen shall be mounted on exterior of louver.
- D. Finish shall be as selected by Architect.

2.03 APPROVED MANUFACTURERS

- A. Air Devices
 - 1. Titus.
 - 2. Price.
 - 3. Tuttle & Bailey.
 - 4. Architect Approved.
- B. Louvers
 - 1. Greenheck.
 - 2. Ruskin.
 - 3. AWW.
 - 3. Architect Approved.

PART 3 - EXECUTION

3.01 INSTALLATION (AIR DEVICES)

- A. Install air devices in accordance with manufacturers' instructions.
- B. Check location of air devices and make necessary adjustments in position to conform with architectural reflected ceiling plan, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with airtight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Provide mounting frame or additional ceiling grid tees as required to mount air devices. Support devices as required to prevent ceiling sag.

3.02 INSTALLATION (LOUVERS)

- A. Locate and place louver units plumb, level and in proper alignment with adjacent work.
- B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joints fillers, as indicated.
- D. Repair finishes damaged by installation operations. Restore finishes so that there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make the required alterations and refinish the entire unit, or provide new unit, at contractor's option.
- E. Protection non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.
- F. Provide concealed gaskets, flashings, joint fillers, and insulations, and install as work progresses to make the installations weathertight.
- G. Refer to Division 7, Section 07900, for sealants in connection with installation of louvers.
- H. Field verify exact opening dimensions and coordinate mounting requirements with General Contractor.

END OF SECTION 23 37 00

AIR COOLED OUTDOOR HEAT PUMP UNITS**PART 1 - GENERAL****1.01 SYSTEM DESCRIPTION**

- A. Outdoor-mounted, air-cooled, split-system heat pump unit suitable for ground or rooftop installation. Unit consists of a hermetic compressor, composite basepan, an air-cooled coil, propeller type condenser fan, suction and liquid line service valve, and a control box. Unit will discharge supply air upward as shown on contract drawings. Unit will be used in a refrigeration circuit to match up to a coil unit.

1.02 QUALITY ASSURANCE

- A. Unit will be rated in accordance with the latest edition of AHRI Standard 210.
- B. Unit will be certified for capacity and efficiency, and listed in the latest AHRI directory.
- C. Unit construction will comply with latest edition of ANSI/ ASHRAE and with NEC.
- D. Unit will be constructed in accordance with UL standards and will carry the UL label of approval.
- E. Unit will have c-UL-us approval.
- F. Unit cabinet will be capable of withstanding ASTM B117 1000- hr salt spray test.
- G. Air-cooled condenser coils will be leak tested at 150 psig and pressure tested at 550 psig.
- H. Unit constructed in ISO9001 approved facility.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit will be shipped as single package only and is stored and handled per unit manufacturer's recommendations.

1.04 WARRANTY

- A. The Contractor shall warranty all material and workmanship for (1) one year from date of substantial completion.
- B. Manufacturers standard parts and compressor warranty.

PART 2 - PRODUCTS

2.01 SUMMARY

- A. The contractor shall furnish and install split system heat pumps as shown as 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. Daikin.
 - 2. Fraser-Johnston
 - 3. Trane.
 - 4. Architect Approved.

2.02 GENERAL DESCRIPTION

- A. Factory assembled, single piece, air-cooled heat pump unit. Contained within the unit enclosure is all factory wiring, piping, controls, compressor, refrigerant Charge R-410A, and special features required prior to field start-up.

2.03 UNIT CABINET

- A. Unit cabinet will be constructed of galvanized steel, bonderized, and coated with a powder coat paint.
- B. All units constructed with louver coil protection and corner post.
- C. Louver can be removed by removing one fastener per louver panel.

2.04 FANS

- A. Condenser fan will be direct-drive propeller type, discharging air upward.
- B. Condenser fan motors will be totally enclosed, 1-phase type with class B insulation and permanently lubricated bearings.
- C. Shafts will be corrosion resistant.
- D. Fan blades will be statically and dynamically balanced.
- E. Condenser fan openings will be equipped with coated steel wire safety guards.

2.05 COMPRESSOR

- A. Compressor will be hermetically sealed.
- B. Compressor will be mounted on rubber vibration isolators.
- C. Condenser coil will be air cooled.

- D. Coil will be constructed of aluminum fins mechanically bonded to copper tubes.

2.06 REFRIGERATION COMPONENTS

- A. Refrigeration circuit components will include liquid-line shutoff valve with sweat connections, vapor-line shutoff valve with sweat connections, system charge of R-32 refrigerant, and compressor oil.
- B. Unit will be equipped with factory installed bi-flow filter drier, suction line accumulator, compressor crank case heater, high capacity muffler, high and low pressure switches.

2.07 ELECTRICAL REQUIREMENTS

- A. Unit electrical power will be single point connection.
- B. Control circuit will be 24v.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Install units on vibration isolation.
- D. Install units on concrete base as indicated.
- E. Provide connection to refrigeration piping system and evaporators.
- F. Install refrigerant piping per manufacturer's instructions.

3.02 MANUFACTURER'S FIELD SERVICES

- A. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION 23 62 13

PART 1 – GENERAL**1.01 WORK INCLUDED**

- A. Packaged air handling units.

1.02 RELATED WORK

- A. Section 23 07 13 - Ductwork Insulation for HVAC.
- B. Section 23 09 33 – Electric and Electronic Control System for HVAC
- C. Section 23 31 00 – HVAC Ducts and Casings.
- D. Section 23 33 00 – Air Duct Accessories.
- E. Section 23 62 13 – Air Cooled Outdoor Heat Pump Units.

1.03 REFERENCES

- A. ANSI/UL 883 - Safety Standards for Fan Coil Units and Room Fan Heater Units
- B. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
- C. ANSI/UL 465/559 - Central Cooling Air Conditioners and Heat Pumps.

1.04 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

1.05 SUBMITTALS

- A. Submit drawings indicating assembly, unit dimensions and weights, required clearances, construction details, and field connection details.
- B. Submit product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and finishes of materials.
- C. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include manufacturer's descriptive literature for start-up instructions, installation instructions, and maintenance procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.07 WARRANTY

- A. Provide one year parts warranty.

PART 2 - PRODUCTS

2.01 SUMMARY

- A. The contractor shall furnish and install air handling unit(s) as shown as 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. Daikin.
 - 2. Fraser-Johnston.
 - 3. Trane.
 - 4. Architect Approved.

2.02 GENERAL

- A. Provide indoor-mounted, packaged air handling unit(s). Unit(s) shall be factory assembled including direct-expansion evaporator coil, expansion valve(s), check valves, condensate drain pan, centrifugal fan assembly with fan motor, filters, and electrical controls. Units shall be suitable for either horizontal or vertical airflow configuration and be used with or without ductwork.

2.03 CASING

- A. Unit casing shall be steel with 1" foil faced insulation.
- B. Access door shall be insulated and gasketed to minimize sound transmission.
- C. Unit shall include circuit breaker(s) for unit and heater(s) power disconnect.
- D. Supply duct flanges on discharge of unit.

2.04 FANS

- A. Provide fan section with forward curved, double width, double inlet, centrifugal type fan.
- B. Provide polarized plug connections and integrated slide deck for easy removal.
- C. Direct drive, 9-speed ECM blower motor.

2.05 COILS

- A. Provide all aluminum coil. Enclose coils with headers and return bends fully contained within casing. Coil shall have factory installed electronic expansion valves and factory pressure and leak tested at 375 psig. Coil shall be provided with integrated slide deck for easy removal. Coil shall have copper sweat refrigerant connections.
- B. Provide drain pan constructed of PVC or galvanized steel with external connections on either side of unit.

2.06 FILTERS

- A. External filter rack shall be provided to accommodate 1” or 2” pleated media filters.
 - 1. Filters shall be accessible from the front of the air handler through a hinged access door.

2.07 CONTROLS

- A. Provide factory installed and wired controls including fan contactor, transformer, low voltage terminal strip and single point power entry provision for electric heat.
- B. Provide 7-day programmable thermostat.

2.08 ELECTRIC HEATING COILS

- A. Provide electric heat coils constructed of heavy-duty nickel chromium elements with pilot duty or automatic line break high limit controls.
- B. Coils shall be UL listed and installed in insulated sheet metal enclosure for installation on fan discharge. Factory supplied and field installed.
- C. Polarized plug shall be provided for making electrical connections to the air handler control box from the supplementary heater.
- D. Heater kit to include circuit breakers which meet UL requirements for service disconnect.

2.10 CONTROLS

- A. Thermostats: Provide 24 volt operation control. Refer to Section 23 0933.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install unit on vibration isolators.

END OF SECTION 23 81 27

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Mini-split heat pump system.
- B. Mini-split heat pump outdoor unit.

1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The system shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2002 and installed to resist the wind pressures on the equipment and the supports.
- F. The outdoor unit will be factory charged with R-32.
- G. A holding charge of dry nitrogen shall be provided in the evaporator.
- H. System efficiency shall meet or exceed 16.0 SEER and 9.2 HSPF.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 MINI-SPLIT HEAT PUMP SYSTEM (EXPOSED WALL MOUNTED EVAPORATOR)

- A. Wall Mounted – High Efficiency
- B. Operating Conditions
 - 1. The indoor unit shall be capable of the following ambient operating range.
 - a) Cooling: 57°F DB to 77°F WB
 - b) Heating: 59°F WB to 81°F DB

- C. General
 - 1. Unit shall be factory assembled, wired, piped and run tested.
 - 2. Unit shall be designed to be installed for indoor application.
 - 3. Unit shall be attached to an installation plate/bracket that secures unit to the wall.
 - 4. The depth of the unit shall not exceed 9 inches.
- D. Casing/Panel
 - 1. Unit case shall be manufactured of heavy-duty Acrylonitrile Butadiene Styrene (ABS) and High Impact Polystyrene (HIPS) plastic.
 - 2. Unit case shall have a pearl white finish: Munsell 7.5 BG 10/2 (RAL 9016).
 - 3. The front surface of the unit shall have an architectural curved panel with pearl white finish and integrated digital display.
- E. Cabinet Assembly
 - 1. Unit shall have one supply air outlet and one return air inlet.
 - 2. Unit shall be equipped with factory installed temperature thermistors for:
 - a) Return air
 - b) Refrigerant entering coil
 - c) Refrigerant leaving coil
 - 3. Unit shall have a built-in control panel to communicate with the outdoor unit.
 - 4. Unit shall have the following functions as standard
 - a) Self-diagnostic function
 - b) Auto restart function
 - c) Auto operation function
 - d) Auto clean function
 - e) Dehumidifying function
 - f) Forced operation
 - g) Hot Start
 - h) Sleep mode
 - 5. Unit shall be capable of refrigerant piping in 4 different directions.
 - 6. Unit shall be capable of drain piping in 2 different directions.
- F. Fan Assembly
 - 1. The unit shall have a direct-drive, cross flow fan made of high strength ABS plastic.
 - 2. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.
 - 3. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
 - 4. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.
 - 5. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Jet Cool, and Auto.
 - 6. In heating mode, the indoor fan shall have the following settings: Low, Med, High, Jet Heat and Auto.
 - 7. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
 - 8. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.

9. Unit shall have factory installed motorized guide vane to control the direction of flow of air from side to side.
- G. Filter Assembly
1. The return air inlet shall have a factory supplied primary removable, washable filter.
 2. The unit shall be equipped with factory supplied secondary 3M Micro Dust Filter.
 3. The filter access shall be from the front of the unit.
- H. Coil Assembly
1. Unit shall have a factory-built coil comprised of aluminum fins mechanically bonded on copper tubing.
 2. Unit shall have minimum of 2 rows of coils.
 3. Unit shall have a factory supplied condensate drain pan below the coil.
 4. Unit shall be designed for gravity drain.
 5. Unit shall have a factory insulated drain hose to handle condensate.
 6. Unit shall have provision of 45° flare refrigerant pipe connections.
 7. The coil shall be factory pressure tested at a minimum of 551 psig.
 8. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
- I. Microprocessor Control
1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.
 2. The unit shall be able to communicate with the outdoor unit using a field supplied minimum of 18 AWG, 4 conductor, stranded, shielded or unshielded power/communication cable. If shielded, it must be grounded to chassis at ODU only.
 3. Central control shall be available through an optional control board for the outdoor unit.
 4. Group control shall be available to allow multiple indoor units to operate from a single controller, or allow connection of more than one controller to an indoor unit.
 5. The unit controls shall operate the indoor unit using one of the five operating modes:
 - a) Auto operation
 - b) Heating
 - c) Cooling
 - d) Dry
 - e) Fan only
- J. Electrical
1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)
 2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.
- K. Condensate Sensor Connection
1. The unit shall include a factory installed condensate sensor connection.
- L. Controls
1. The indoor unit shall be supplied with a wireless handheld controller.
 2. An optional wired controller shall be available as an additional

- 3. accessory.
The unit shall have built-in (factory installed) Wi-Fi to allow monitoring and control through a smart device application.

M. Warranty

- 1. Please refer to the respective outdoor unit for applicable warranty.

2.02 OUTDOOR UNITS – HIGH EFFICIENCY

A. Product Design:

- 1. The HVAC system shall be a variable capacity, direct expansion (DX) heat pump engineered system consisting of a single outdoor unit and an indoor unit. The outdoor unit shall have a single inverter compressor. The outdoor unit shall be connected to a ductless indoor unit through a network of piping and control wiring. Each indoor unit shall be capable of providing individual control.
- 2. The heat pump system will be available in 208/230V, 60Hz, 1 phase.

B. Operating Conditions

- 1. The outdoor unit shall be capable of the following ambient operating range:
 - a) Outdoor Unit
 - 1) Cooling: 0°F DB to 118°F DB
 - 2) Heating: -13°F WB to 75°F DB

C. General Features

- 1. Unit shall be manufactured by Daikin.
- 2. The air-conditioning system shall use R410A refrigerant.
- 3. The system shall have one air source outdoor unit.
- 4. Refrigerant circuit for piping system
 - a) The refrigerant circuit shall be field piped to an indoor unit to effectively and efficiently control the heating or cooling operation of the system.
 - b) All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
- 5. Factory installed microprocessor controls in the outdoor unit and indoor unit shall perform functions to efficiently operate the system and communicate in from outdoor unit to indoor unit via minimum 14 AWG, 4 conductor and stranded, shielded or unshielded power/communication cable. If shielded, it must be grounded to chassis at ODU only.
- 6. The outdoor unit shall be internally assembled, wired and piped from the factory.
- 7. The factory assembled system shall have the outdoor unit fitted with refrigerant strainer, check valves, oil separator, accumulator reversing valve, electronic expansion valve, high side and low side refrigerant charging ports, and a service port.

D. Field Supplied Refrigerant Piping Design Parameters

- 1. The outdoor unit shall be capable of operating at an elevation of 49.2 feet above or below the indoor units.
- 2. The outdoor unit shall be capable of operating up to 120 feet of total equivalent refrigerant piping length.

- E. Defrost Operations
 - 1. The outdoor unit shall be capable of auto defrost operation to melt accumulated ice off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.
 - 2. The unit shall include a factory installed drain pan heater.
- F. Oil Management
 - 1. The outdoor unit shall have an oil injection mechanism to ensure a consistent film of oil on all moving compressor parts at low speed.
 - 2. The outdoor unit shall have an oil separator to separate oil mixed with the refrigerant gas during compression and return oil to the compressor.
- G. Fan and Motor Assembly
 - 1. Each outdoor unit shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor with a horizontal air discharge.
 - 2. The fan blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.
 - 3. The fan(s) shall be equipped with permanently lubricated bearings.
 - 4. The fan motor(s) shall have variable speed to a maximum of 950 RPM.
 - 5. The fan(s) shall have a raised guard to help prevent contact with moving parts.
- H. Cabinet
 - 1. The outdoor unit cabinet shall be made of pre-coated metal (PCM).
 - 2. The front/side panels of the outdoor unit shall be removable type for access to internal components.
 - 3. Outdoor unit cabinet shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.
- I. Outdoor Unit Coil
 - 1. The outdoor unit shall have a factory-built coil comprised of aluminum fins mechanically bonded on copper tubing.
 - 2. The aluminum fins shall have factory applied corrosion resistant GoldFin™ material.
 - 3. Coil coating shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.
 - 4. The outdoor unit coil shall be factory tested to a pressure of 600 psig.
 - 5. The coil for each outdoor unit shall have a minimum of 14 Fins per Inch (FPI).
 - 6. The coil for each outdoor unit shall have a 2-row heat exchanger.
 - 7. The outdoor unit cabinet shall have a coil guard.
- J. Compressor(s)
 - 1. The outdoor unit shall be equipped with one hermetically sealed, digitally controlled, inverter driven twin-rotary compressor.

2. The inverter driven, digitally controlled compressor shall be capable of operating in a frequency range from 20 Hz to 100 Hz with control in 1 Hz increments.
 3. The compressor shall be mounted on vibration attenuating rubber grommets.
 4. The compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
 5. The compressor bearing(s) shall have Teflon™ coating.
 6. The compressor shall be equipped with over-current protection.
- K. Operational Sound Levels
1. The outdoor unit shall have sound levels not exceeding 55 dB(A) tested in an anechoic chamber under ISO 3745 standard.
- L. Sensors
1. The outdoor unit shall have
 - a) Suction temperature sensor
 - b) Discharge temperature sensor
 - c) High pressure sensor
 - d) Low pressure sensor
 - e) Outdoor temperature sensor
 - f) Outdoor unit heat exchanger temperature sensor
- M. Wind Load Installations for Outdoor Units
1. Provide Florida wind Load Installation Drawings that meet the requirements of the 2017 Florida Building Code, 6th Edition and ASCE Standard 7-2010 with submittal.
- N. Warranty
1. Limited Warranty Period
 - a) STANDARD FIVE (5) YEAR WARRANTY FOR A QUALIFIED SYSTEM - The Part(s) of a qualified System, including the compressor, are warranted for a period (the “Standard Parts Warranty Period”) ending five (5) years after the date of original installation. In absence of proof of installation, the warranty date will end five (5) years from the date of manufacture.

PART 3 – EXECUTION

- 3.01** Orient unit to obtain maximum air flow to condenser coil and adequate clearance for service (refer to manufacturer’s installation instructions).
- 3.02** Install unit level and attach to supports.
- 3.03** Install interconnecting refrigerant piping between outdoor unit and indoor unit. Arrange piping to provide access for service panel removal and to avoid restricting service walk area.
- 3.04** Coordinate location of electrical connections with electrical contractor.
- 3.05** Install condensate drain piping.

3.06 Install control wiring in conduit.

END OF SECTION 23 81 28

The Engineer of Record for Divisions 26 and 27 of the Specifications for the Regional Field Office Renovations Project, Arkansas Game and Fish Commission, Jonesboro, Arkansas (P&P Job No. 25-142) is:

7-30-26

Date



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COMMON WORK RESULTS FOR ELECTRICAL**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Basic Electrical Requirements specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

- A. The following specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:
 - 1. American Society for Testing Materials.
 - 2. American Standards Association.
 - 3. Americans with Disabilities Act (ADA).
 - 4. Arkansas Energy Code (ASHRAE 90.1).
 - 5. Arkansas Fire Prevention Code.
 - 6. Illuminating Engineering Society.
 - 7. Institute of Electrical and Electronic Engineers.
 - 8. International Building Code, 2021 Edition.
 - 9. Local, City and State Codes and Ordinances.
 - 10. National Electrical Code, 2026 Edition.
 - 11. National Electrical Manufacturers Association.
 - 12. National Electrical Safety Code, 2002 Edition.
 - 13. National Fire Protection Association's Recommended Practices.
 - 14. Occupational Safety and Health Act.
 - 15. Power Cable Engineers Association.
 - 16. Service requirements of serving utility company.
 - 17. Underwriter's Laboratories, Inc.

1.03 SUBMITTALS

- A. Submit six (6) sets of shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. The basic information for each item of equipment to be included is as follows:
 - 1. Index.
 - 2. Installation and Operating Instructions
 - a. Individual tabbed sections.
 - b. Manufacturer descriptive literature.
 - c. Applicable control diagrams.
 - d. Composite wiring diagrams.
 - 3. Each submittal sheet shall be clearly marked with equipment Catalog Number and accessory items being submitted.

1.04 REGULATORY REQUIREMENTS

- A. Work shall conform to all applicable codes, specifications, local ordinances, industry

standards and utility company regulations.

- B. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may at his option propose any article, approved equal to or better than that specified, as approved in writing by the Engineer.
- C. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.
- D. 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 shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.
- E. Non-Compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- F. All required fees, permits and inspections shall be obtained and paid for by the contractor under the section of the specifications for which they are required.

1.05 ELECTRICAL LICENSE REQUIREMENT

- A. No person shall perform electrical work on the Contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiner's Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one-to-one ratio.
- B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.
- C. The Arkansas Department of Labor requires that the worker, who installs raceway for low voltage cables of temperature controls, fire alarm, telecommunications, intrusion detection, access control, public address, television distribution, etc., be paid the electrician's minimum wage rate.

1.06 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions. The Engineer/Owner reserves the right to relocate any device a maximum distance of 6'-0" at the time of installation without an extra cost being incurred.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.07 CONTRACTOR REVISED DRAWINGS

- A. The Contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.
- B. Upon completion of the work and prior to final payment, the Contractor shall furnish to the Engineer, one set of "contractor revised" reproducibles, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

1.08 GUARANTEE

- A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.
- B. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of one (1) year.

1.09 OPERATING AND MAINTENANCE MANUALS

- A. After approval of materials and equipment for use in this project, 3 copies of an Operation and Maintenance Manual shall be submitted for approval.
- B. The basic information for each item of equipment to be included is as follows:
 - 1. Index
 - 2. Maintenance and operating instructions
 - a. Manufacturer's descriptive literature and maintenance manuals
 - b. An Approved Set of Shop drawings
 - c. Applicable control diagrams
 - d. Composite wiring diagrams as applicable showing all motor controllers, relays, etc., with interlocking provisions as built in the job, along with a written description of the control sequence if applicable.
 - e. Spare parts list (when parts are provided)
 - f. Listing of part suppliers and their addresses
 - g. Single line diagram of the "as built" building electrical distribution system.
- C. Upon final approval, submit one (1) bound copy of the approved Operation and Maintenance Manual to the Engineer and hold two (2) copies for instruction of Owner as hereinafter specified.

1.10 CONFLICTS BETWEEN DRAWINGS AND SPECIFICATIONS

- A. If a conflict between the drawings and the specifications occurs, the most stringent

requirement shall apply.

PART 2 - PRODUCTS

2.01 UL LISTING

- A. Where the Underwriter's Laboratories have an applicable standard, the product shall be listed with UL and shall be so marked.

2.02 SUBSTITUTIONS

- A. Each Section of the Project Manual, when applicable has a paragraph entitled "Manufacturers". If "Engineer Approved Equal" is not in the list of manufacturers, no substitutions will be accepted. Submit one of the manufacturers listed.
- B. The Engineer does not give any prior approvals on submittals. Do not call the Engineer for prior approval.

PART 3 - EXECUTION

3.01 600 VOLT INSULATION TEST

- A. Prior to energizing the electrical system, the contractor shall provide insulation resistance tests for all distribution and utilization equipment. The Contractor shall provide a suitable and stable source of test power. The insulation test shall be a "megger" test at 500 volts D.C. for one-half minute. A test report shall be submitted to the Engineer. The minimum insulation resistance for No. 12 AWG conductors shall be 1,000,000 ohms and for larger conductors shall be 250,000 ohms. Conductors testing below the minimum insulation resistance shall be replaced and tested again.

3.02 CONTINUITY TEST

- A. The Contractor shall perform a continuity test on the entire electrical system prior to energizing the system to ensure proper cable connections.

3.03 CONNECTION TORQUE TESTS

- A. All No. 1/0 AWG and larger conductors with bolted connections shall be torque tested using a torque wrench. Torque shall be to National Electrical Testing Association's (NETA) Standards.

3.04 REMOVAL OF RUBBISH

- A. Contractor shall remove his rubbish from building site at intervals and shall maintain the spaces allotted him in an orderly manner. On completing his work, and prior to submission of final estimate, he shall remove all tools, appliances, material and rubbish from the grounds.

3.05 GROUND RESISTANCE MEASUREMENTS

- A. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Engineer. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and grounding system and submission of test results to the Engineer. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the soil conditions at the time the test was performed. When the building water service is used as a ground of part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142. Submit test reports with Operation and Maintenance Manuals.

3.06 MECHANICAL OPERATION TESTS

- A. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are functioning.

3.07 ROTATIONAL TESTS

- A. The Contractor shall assist Division 15 in performing rotational tests on all motors. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor's color coding shall be changed.

3.08 INSTRUCTING OWNER'S REPRESENTATIVE

- A. The Contractor shall instruct representatives of the Owner in the proper operation and maintenance of all elements of the Electrical system.
- B. Contractor shall spend not less than one (1) day in such formal instruction to fully prepare the Owner's representative to operate and maintain the Electrical systems.

3.09 UL LISTINGS

- A. The Contractor shall bear all responsibility for any work, which he performs, that voids any UL listings of any equipment.

3.10 OWNER OCCUPIED BUILDINGS

- A. Holes cut in Owner occupied buildings shall be done with drills with vacuum attachments that vacuum cuttings as the drill cuts.
- B. All drilling, hammering, or other loud construction activities shall be done after Owner's normal working hours.
- C. Conduit cutting will be done outside.

- D. Contractor shall clean work area at the end of each day.

3.11 OBJECTIONABLE NOISE AND/OR HARMONICS

- A. If after installation of the electrical system, it is found that objectionable noise or harmonics exists on the electrical system, the manufacturer of the equipment which is producing the objectionable noise or harmonics shall install the proper electrical equipment to prevent the noise and/or harmonics from emitting onto the building's electrical system and shall be contained within the offending equipment.

3.12 VOLTAGE MEASUREMENTS

- A. Contractor shall measure and record voltage at service equipment with as much load on the system as possible. Contractor shall measure and record phase-to-phase, phase-to-neutral, and phase-to-equipment ground voltages for each phase. Where harmonic cancellation transformers are installed, contractor shall also measure and record phase-to-phase, phase-to-neutral and phase-to-equipment ground voltages for each phase on the secondary side of the transformers. Contractor shall submit records of these voltages with the Operation and Maintenance Manuals.

3.13 REMOVAL OF PAINT AND OTHER FINISHES

- A. The contractor shall remove all paint and other non-factory finishes applied inadvertently by other subcontractors to all electrical equipment.

3.14 TEMPORARY CONSTRUCTION POWER AND LIGHTING

- A. The contractor shall provide all necessary temporary construction power and lighting to accomplish the work.
- B. After the construction is completed, the contractor shall remove all temporary construction power and lighting.

3.15 PROJECT PHASING

- A. The contractor shall become familiar with the project phasing prior to his bidding the project and shall include in his bid, the amount of money required by him to provide the necessary labor, materials, adjustments, programming, reprogramming, and accessories to provide the project in the phases shown within the general conditions of the contract documents.

END OF SECTION 26 05 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to elevator, plumbing, appliances, and mechanical equipment specified under other sections or Owner furnished equipment.

1.02 RELATED SECTIONS

- A. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- B. Section 26 05 19 – Low-Voltage Electrical Power Connectors and Cable.
- C. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- D. Section 26 28 16 - Enclosed Switches and Circuit Breakers.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NEMA WD 1 - General Purpose Wiring Devices.
- C. NEMA WD 6 - Wiring Device Configurations.
- D. NFPA 72 - National Fire Alarm Code.
- E. UL 498 - Attachment Plugs and Receptacles.
- F. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to requirements of the Arkansas State Fire Protection Code.

1.06 COORDINATION

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections. Verify voltage, ampere, and phase ratings before beginning any of the work. Notify Engineer immediately of any discrepancies found. Any work installed that has to be replaced because of the contractor's failure to verify these ratings will not be reimbursed. Verify that equipment furnished under other sections has disconnects and starters, if so specified in other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- D. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.01 CORDS AND CAPS

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Pass & Seymour.
 - 3. Arrow-Hart.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD-6; match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: ANSI/NFPA 70, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating at branch circuit overcurrent protection.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using liquidtight flexible conduit with watertight connectors.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices as indicated and as required by applicable codes.
- G. Provide interconnecting conduit and wiring between devices and equipment where indicated.
- H. All flexible conduit to pumps, chillers, air handling units, outdoor equipment, and water heaters shall be liquidtight.
- I. Ground all metal equipment. Ensure that bonding breaks through paint to bare metallic surface of all painted metallic equipment.
- J. The contractor shall check overload settings, wire sizes, fuse/circuit breaker sizes & disconnect sizes of equipment provided by others for compliance with the National Electrical Code and shall:
 - 1. Adjust settings where possible.
 - 2. Advise the Engineer of non-compliance where remedy will require more than just adjustments.

END OF SECTION 26 05 02

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.02 RELATED SECTIONS

- A. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- C. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NETA – National Electrical Testing Association.
- C. UL 83 - Thermoplastic Insulated Wires and Cables.
- D. UL 486 A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- E. UL 486 C - Splicing Wire Connectors.
- F. UL 1581 - Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide for each wire and cable type.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.07 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductors shall be copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.08 COORDINATION

- A. Determine required separation between cable and other work.
- B. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - BUILDING WIRE AND CABLE

- A. Triangle.
- B. American.
- C. Engineer Approved.

2.02 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THW (feeder circuits) and THHN/THWN (branch circuits).

2.03 WIRING CONNECTORS/LUGS

- A. All cable and wire terminals, lugs, taps, and splices shall be made secure with compression type connectors, approved for the service. Connections shall be installed

with approved tools and dies to assure a permanent secure joint. Compression joints shall be cleaned and made smooth with insulating compound. Connectors in dry locations shall be wrapped with varnish cambric and insulated with approved electrical grade plastic tape. Where conductors are to be connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are to be installed. Provide all necessary hangers, racks, cleats, and supports required to make a neat installation. Wire connectors shall conform to UL 486.

- B. Connectors in wet or damp locations shall be covered with heat shrinkable products equal to Scotch #ITCSN Series.
- C. Contractor shall provide and install all connectors, taps, lugs, and splices as required to connect all wires and cables provided under the contract. Contractor shall torque all bolted connections to manufacturer's specifications. If manufacturer's specifications do not apply, use NETA specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation verify that interior of building has been protected from weather.
- B. Prior to installation verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

- A. Interior Locations: Use only building wire, Type THW or use THHN/THWN insulation, in raceway unless otherwise indicated on the Drawings.
- B. Wet or Damp Interior Locations: Use only building wire, Type THW or THHN/THWN in raceway or liquidtight flexible conduit.
- C. Exterior Locations: Use only building wire, Type THW or THHN/THWN insulation in raceway.
- D. Underground Installations: Use only building wire, Type THW or USE insulation in raceway.
- E. Use wiring methods indicated on Drawings.
- F. On the load side of GFIC circuit breaker, use only Type XHHW conductors.

3.04 INSTALLATION

- A. Install products in accordance with manufacturers instructions.
- B. Use solid conductors for feeders and branch circuits No 10 AWG and smaller, except branch circuits to motors shall be stranded copper for flexibility. Stranded conductors may be used if tapped to solid conductors before terminating to wiring devices.
- C. Use stranded conductors for control circuits 24 volts and below. Minimum size shall be No. 16 AWG.
- D. Use conductors not smaller than No. 12 AWG for power and lighting circuits and 120 volt control circuits.
- E. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet or where the distance to the first outlet exceeds 50 feet.
- F. Use No. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger.
- I. Protect exposed cable from damage.
- J. Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.
- K. Use suitable cable fittings and connectors.
- L. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- M. Clean conductor surfaces before installing lugs and connectors.
- N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Split bolt connectors are not allowed.
- O. Use sleeve compression connectors for copper conductor splices and taps, No. 6 AWG and larger. Insulated uninsulated conductors and connector with heat shrink insulation rated 600 volts.
- P. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.
- Q. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.
- R. Route circuits at own discretion; however, circuit numbers shall be according to Drawings.

- S. Do not share neutral or ground on computer circuits. Each circuit shall be run in a separate raceway.
- T. On three phase, four wire systems do not use a common neutral for more than 3 circuits.
- U. On single phase, three wire systems do not use a common neutral for more than 2 circuits.
- V. Where a common neutral is run for 2 or 3 homerun circuits, connect phase conductors to breakers in panel, which are attached to separate phase legs in order that the neutral conductors will carry only the unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
- W. Run conductors of same circuit in same conduit.
- X. Run conductors of different voltage system in separate conduits.
- Y. Color-code conductors as follows:

	<u>208Y120 Volts</u>	<u>Switchlegs</u>
Phase A	Black	Violet
Phase B	Red	Pink
Phase C	Blue	
Ground	Green	
Neutral	White	
Isolated Ground	Green with Yellow Stripe	

- Z. Contractor shall not install more than three (3) current-carrying conductors in one conduit without derating the conductors per NEC Table 310-15(b)(2)(a).
- AA. Where cables not in conduit pass through floors, cables shall be enclosed in conduit extending at least 6 inches above the floor.
- BB. Cables shall be protected from physical damage where necessary by conduit.
- CC. All cable splices shall be made in boxes.
- DD. The radius of bends in cables shall not be less than five times the diameter of the cable.
- EE. Cables shall be secured by staples, straps, j-hooks, or similar fittings every 4-1/2 feet and within 12 inches of every cabinet, box and fitting.
- FF. Do not pull cable sheaths back more than necessary to separate conductors.
- GG. Do not score conductors when peeling back conductor insulation. Scored conductors will be replaced.
- HH. Do not cut off strands from stranded conductors at terminations. Conductors with

strands missing shall be replaced.

- II. Kinked, torn, or twisted cable sheaths are unacceptable and shall be replaced.
- JJ. Install wire and cables to avoid chemicals, cold temperature bending, and different lengths of conductors of same circuit.
- KK. Make sure conduits are properly terminated, reamed and brushed before installation of wire and cables.
- LL. Cable sheaths shall be held in place by strain relief fittings.
- MM. Verify proper conductor location at each termination before energizing.
- NN. All parallel conductors shall be of the same length, type, size and shall have the same connector pressures.
- OO. Do not splice service entrance or feeder conductors.
- PP. Maintain 18 inch clearance from all wires and cables to hot water pipes, steam pipes, and flues.
- QQ. Route all cables parallel and perpendicular to walls. This includes cables installed above ceilings, in attics, and in crawl spaces.

3.05 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of 26 0553 – Identification for Electrical Systems.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings in each junction box, switch, switchboard, control panel, and in each panelboard.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values, if applicable. If not applicable, use NETA's recommended values.
- D. Verify continuity of each branch circuit conductor.
- E. Check tightness of all connections.

3.07 USE OF THE FOLLOWING IS PROHIBITED

- A. Aluminum conductors.
- B. Wire nuts in damp or wet locations.
- C. Copper-clad aluminum conductors.

END OF SECTION 26 05 19

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.
- D. Chemicals.
- E. Conduit.

1.02 RELATED SECTIONS

- A. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- B. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. UL 467 - Grounding and Bonding Equipment.

1.04 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe, if any.
- B. Metal frame of the building, if any.
- C. Electrode.
- D. Rod electrode.
- E. "GEM" encased in direct contact with earth.

1.05 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: No greater than 5 ohms.

1.06 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.

- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of exothermic connectors.

1.07 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.
- B. Accurately record actual locations of grounding electrodes.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.

1.09 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 ROD ELECTRODE

- A. Material: Copper clad steel.
- B. Diameter: 3/4 inch.
- C. Length: 10 feet.

2.02 WIRE

- A. Material: Stranded or solid copper.
- B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.
- C. Wire shall conform to Section 26 05 19.

2.03 EXOTHERMIC CONNECTIONS

- A. Cadweld.
- B. Approved Equal.

2.04 CHEMICALS

- A. Ground enhancement materials (50 lbs. minimum per rod).
- B. Cadweld "GEM" system, or approved equal.

2.05 CONDUIT

- A. Conduit shall conform to Section 26 05 33.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that final backfill and compaction has been completed around area where chemical ground is to be installed.

3.02 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Auger a 3 inch diameter hole to a depth of 9-1/2 feet.
- C. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Drive rod 1 foot into ground. Make Cadweld connection. Pour chemicals around rod. Tamp around rod. Pour water in augered hole. Remove excess water from hole. Fill remainder of augered hole with soil. Tamp soil.
- D. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus or bushing.
- F. Size and type of green equipment ground conductors and method of securing them to obtain electrical continuity and effective grounding as per National Electrical Code, Article 250. Conduit shall not be used for grounding.
- G. Neutrals shall be grounded in accordance with the National Electrical Code.
- H. All metal raceway system, including cabinets, conduit and boxes, shall be grounded in accordance with the National Electrical Code.
- I. An equipment ground conductor shall be installed in all conduits.
- J. Install a grounding electrode and grounding electrode conductor at the service equipment, meter, current transformer cabinet, and at each dry type transformer.

- K. The grounding electrode shall be connected to the metal structure of all buildings with metal structures and to a 1-1/2 inch or larger cold-water pipe, if metallic. The ground connection to the metal structure shall be exothermic.
- L. Install isolated ground conductors all the way back to the service equipment ground for 240- and 208-volt services.
- M. Provide grounding of pad-mounted transformer as required by the Utility.
- N. Connect equipment ground conductor of branch circuits serving gas appliances to metallic gas lines. Do not use metallic gas lines as a grounding electrode of the electrical system.
- O. Ground all metal non-current carrying equipment. Ensure that bonding breaks through paint to bare metallic surface of all painted metallic equipment.

3.03 FIELD QUALITY CONTROL

- A. Inspect equipment grounding conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION 26 05 26

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Conduit, cable and equipment supports.
- B. Anchors and fasteners.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NECA - National Electrical Contractors Association.
- C. UL 514B - Fittings for Conduit and Outlet Boxes.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners, and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Perforated strap iron will not be acceptable as hanger or fastening material.

- D. Plastic tie wraps will not be acceptable as support materials, except:
 - 1. Inside enclosures to neatly train cables and wires.
- E. Channels shall be galvanized and not painted.
- F. All hardware shall be galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and other conduit.
- D. Obtain permission from the Engineer before using powder-actuated anchors.
- E. Obtain permission from the Engineer before drilling or cutting structural members.
- F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- G. Install surface-mounted cabinets with minimum of four anchors. Provide blocks between studs to support anchors.
- H. In wet and damp locations use steel channel supports to stand cabinets one inch off wall.
- I. All conduits, both horizontal and vertical, shall be accurately supported. Each hanger shall be properly sized to fit supported conduit.
- J. Where lines are supported under concrete construction, hanger rods shall be secured with concrete inserts.
- K. All hangers shall be so located as to properly grade and support horizontal conduits without appreciable sagging of these lines.
- L. Where multiple conduits are run horizontally at the same elevation and grade, they may be supported on trapezes of channels suspended on rods. Trapeze numbers, including suspension rods, shall be properly sized for number, size, and loaded weight of conduits to be supported.
- M. Conduit supports shall be installed within 3 feet of each coupling, connector, and box.
- N. Electrical contractor shall install his own supports for his equipment.

- O. All 2 inch and larger conduits shall have a swivel hanger support equal to B-Line #B446 or #B446C.

END OF SECTION 26 05 29

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rigid steel conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Surface mounted raceway.
- F. PVC conduit.
- G. Fittings and conduit bodies.
- H. Wall and ceiling outlet boxes.
- I. Floor boxes.
- J. Pull and junction boxes.

1.02 RELATED SECTIONS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems.
- D. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 27 26 - Wiring Devices.
- F. Section 26 05 02 - Equipment Wiring Systems.

1.03 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- C. ANSI/NFPA 70 - National Electrical Code.

- D. NECA "Standard of Installation".
- E. NEMA TC 3 - PVC Fittings to Use with Rigid PVC Conduit and Tubing.
- F. UL 1 - Flexible Metal Conduit.
- G. UL 5 - Surface Metal Raceways and Fittings
- H. UL 6 - Rigid Metal Conduit.
- I. UL 360 - Liquid-tight Flexible Steel Conduit.
- J. UL 652 - Schedule 40 and 80 Rigid PVC Conduit.
- K. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- L. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- M. UL 38 - Boxes for Use with Fire-Protection Signaling Systems, Manually Actuated Signaling.
- N. UL 50 - Cabinets and Boxes.
- O. UL 514A - Metallic Outlet Boxes.
- P. UL 514B - Fittings for Conduit and Outlet Boxes.
- Q. UL 996 - Electrical Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.
- R. UL 1241 - Junctions Boxes for Swimming Pool Lighting Fixtures.
- S. UL 1773 - Termination Boxes.
- T. UL 65 - Wired Cabinets.

1.04 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.05 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, non-metallic conduit, fittings, and conduit bodies.

- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.06 PROJECT RECORD DOCUMENTS

- A. Accurately record actual routing of conduits larger than 2 inches.
- B. Submit under provisions of Division 1.
- C. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site.
- B. Inspect all conduit for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit and openings prior to rough-in.
- C. Route conduit as shown on Drawings in approximate locations unless specifically dimensioned. Route as required to complete wiring system.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. The exact location of all electrical boxes shall be as approved by Engineer who reserves the right to change any outlet for a distance of 6 feet in any direction from position shown on plans, before work is roughed-in, without extra charge.

PART 2 – PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
 - 1. Conduit installed below grade shall be Schedule 80 PVC. All elbows and riser up thru floor slabs shall be galvanized rigid steel conduit (RSC).
 - 2. All conduit not installed under the floor slab shall be 24 inches below grade unless otherwise noted.
- C. Outdoor Locations, Above Grade, and On Roofs: Use galvanized rigid steel conduit. On roofs install 4 inch by 4 inch square treated wooden blocks on roof to support rigid steel conduit within 3'-0" of each coupling and box and to support liquidtight flexible conduit every 3'-0".
- D. Dry Locations:
 - 1. Concealed: Use electric metallic tubing.
 - 2. Exposed:
 - a. Use galvanized rigid steel conduit in unfinished areas only (Electric Room, Mechanical Room) unless noted otherwise.
 - b. Use surface metal raceway where specifically indicated in finished areas of existing buildings where it is impossible to fish flexible metallic conduit down inside of existing walls.
- E. Mechanical and Electrical Rooms:
 - 1. Use 6'-0" maximum length liquidtight flexible conduit for final connections to mechanical equipment and dry type transformers. Support all flexible conduit every 3'-0".
 - 2. Use galvanized rigid steel conduit where exposed.
- F. In Slabs Above Grade: Use galvanized steel only. Conduits shall not cross each other. Refer to Drawings for specific notes for conduit in slab locations.
- G. Electrical metallic tubing (EMT) is to be used for all HVAC equipment control wiring. The conduit system for HVAC temperature controls is to be furnished and installed by Division 15 in accordance with the requirements specified herein. Line voltage control work not specifically shown on the electrical drawings shall be furnished and installed by Division 15 with all line voltage work and all conduit work performed by licensed electricians.
- H. Use surface metal raceway only in existing facilities where conduit cannot be fished down walls or across finished ceilings. Surface metal raceway shall not be used in new buildings, unless noted on the Drawings.

2.02 RIGID STEEL CONDUIT

- A. Manufacturers:
 - 1. Allied.
 - 2. Triangle.
 - 3. Engineer Approved.
- B. Rigid Steel Conduit: ANSI 80.1
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.03 FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. Allied.
 - 2. Triangle.
 - 3. Engineer Approved.
- B. Description: Interlocked steel construction.
- C. Fittings: ANSI/NEMA FB 1.
- D. Maximum Length: 6'-0".

2.04 LIQUIDTIGHT METAL CONDUIT

- A. Manufacturers:
 - 1. Allied.
 - 2. Triangle.
 - 3. Engineer Approved.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Fittings: ANSI/NEMA FB 1.
- D. Maximum Length: 6'-0".

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied.
 - 2. Triangle.
 - 3. Engineer Approved.
- B. Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast compression type.

2.06 SURFACE METAL RACEWAY

- A. Manufacturers:
 - 1. Wiremold.
 - 2. Engineer Approved.
- B. Description: Surface metal raceway with hidden supports.
- C. Fittings, Boxes, and Conduit Bodies: As manufactured by surface metal raceway manufacturer.

2.07 NONMETALLIC CONDUIT

- A. Manufacturers:
 - 1. Carlon.
 - 2. Engineer Approved.
- B. Description: NEMA TC 3; Schedule 80 PVC.
- C. Fittings and Conduit Bodies: NEMA TC 3.

2.08 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
 - 3. Receptacle, single switch, and 2 gang switch boxes for wood studs shall be Racor #194 or #235 with plaster ring of proper depth.
 - 4. Receptacle, single switch, and 2 gang switch boxes for metal studs shall be Racor #196 or #235 with plaster ring for proper depth.
 - 5. Gang switches of 3 or more devices for wood or metal studs and exposed work shall be Racor #950 Series, appropriate gang box and raised cover.
 - 6. Lighting fixture outlet boxes for wood or metal studs, masonry walls, and furred ceilings shall be Racor #166, #167, or Racor #194 or #235 with plaster ring.
 - 7. Junction boxes for wood or metal studs, masonry walls, furred ceilings and interior exposed work shall be Racor #231, #232, #233, or #235.
 - 8. Receptacle boxes for masonry walls shall be Racor #695 or #191 with #785 device cover.
 - 9. Switches in 6 inch and wider masonry walls shall be 3-1/2 inch deep masonry boxes of gang required. Masonry boxes in 4 inch walls shall be 2-1/2 inches deep.
 - 10. Television outlet boxes shall be Racor #246, 4-1/16 inch box with #836 device cover ring. Telephone outlet boxes shall be Racor #256.
 - 11. Outlet boxes for interior exposed work in unfinished areas shall be Racor #191, #192, #231, or #232 boxes with 1/2 inch raised, 4 inch square cover of appropriate configuration.
 - 12. Boxes, for interior exposed work on existing walls and ceilings in finished areas in existing buildings, where it is impossible to fish conduit down walls

or above ceilings, shall be boxes as manufactured by the surface metal raceway manufacturer for the intended purpose.

- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer.
- C. Boxes shall be oversized when required by Table 370-16(a) of the National Electrical Code.
- D. Specialty A/V floor boxes shall be as scheduled on the drawing, "FSR" or equal

2.09 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface-Mounted Cast Metal Box: NEMA 250, Type as required; flat-flanged, surface-mounted junction box.
 - 1. Material: Galvanized steel.
- C. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation".
- B. Install surface metal raceway in accordance with manufacturer's directions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Supports shall be installed within 3 feet of every outlet box, junction box, panel, or other conduit terminations. Fastening of unbroken lengths shall be permitted to be increased to a distance of 5 feet where structural members do not readily permit fastening within 3 feet. Do not space supports further than 10 feet apart.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- H. Do not attach conduit to ceiling support wires.

- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route all conduit parallel and perpendicular to walls. This includes conduit installed above ceilings, in attics, on roofs, and in crawl spaces.
- K. Install insulated bushings or approved equivalent on each end of all conduit.
- L. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Install no more than equivalent of four 90-degree bends between boxes. Use factory elbows for all 90 degree bends in conduits 1" and larger.
- P. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- Q. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.
- R. Use suitable caps to protect installed conduit against entrance of dirt and moisture during construction.
- S. Ground and bond conduit under provisions of Section 26 05 26.
- T. Identify conduit under provisions of Section 26 05 53.
- U. Provide suitable pullboxes in all conduit runs as required by the National Electrical Code and as required to facilitate wire installation.
- V. Holes for passage of conduits through all one-hour and two-hour drywall partitions shall be neatly cut to the required size. If holes are cut larger than necessary, they shall be covered with two (2) additional pieces of 5/8 inch type X gypsum wallboard, each 8 inches by 16 inches with a half circular cutout of the proper size, one (1) layer on one-hour partitions, and two (2) layers on two-hour partitions.
- W. Holes for passage of conduits through one-hour, two-hour, and four-hour masonry walls shall be fireproofed. Fireproofing materials shall be as follows:
 - 1. Cellular Glass Insulation: Pittsburgh Corning Corp. Foamglas "Regular" or UL rated or UNI-JAC UL rated pipe insulation, or approved equal.
 - 2. Fire Retardant Putty: IPC Flamesafe Type FAS500 or FST600 Series, or improved equal, for one-hour and two-hour walls.
 - 3. IPC/KB5 Mortar Seal, or approved equal (full depth of wall) for four-hour walls.
- X. Holes for passage of conduits through masonry floors shall be fireproofed. Fireproofing material shall be Firestop Compound - IPC Flamesafe Type 500/FST

600, or approved equal, filled to full depth of slab. Minimum annular space around conduit shall be 3/16 inch.

- Y. Refer to Architectural drawings for locations of fire-rated walls, ceilings, and floors.
- Z. Support 2-1/2 inch and larger conduit in accordance with Section 26 05 48.
- AA. All flexible conduit in Mechanical Rooms and outside shall be liquidtight flexible conduit.
- BB. All conduits that enter a building's basement wall below grade shall have a fitting equal to OZ Type CSBI installed inside the conduit and shall be watertight sealed between outer conduit wall and basement opening.
- CC. Conduits, which enter refrigerated areas, such as walk-in coolers and wall-in freezers, shall have a seal-off installed on the non-refrigerated side of the conduit where the conduit exits or enters the refrigerated area.
- DD. Make sure conduits are properly terminated, reamed, and brushed before installation of wire or cable.
- EE. Install bushings on all conduits.
- FF. Structural Engineer shall approve placement of conduits in all concrete slabs, beams, and columns. See Structural Drawings for structural engineer's name and address.
- GG. Conduits which pass from an air-conditioned space to a non-air-conditioned space shall have sealoffs installed on non-air-conditioned side near wall.
- HH. Ground metallic conduits.
- II. Install gasketed conduit hubs on all conduits exiting the top or sides of NEMA 3R enclosures.
- JJ. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- KK. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- LL. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- MM. Install boxes to preserve fire resistance rating of partitions and other elements.
- NN. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- OO. Use flush mounting outlet boxes in finished areas, unless noted otherwise on the Drawings.

- PP. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inch separation in acoustic rated walls. See Architectural floor plans for acoustic rated wall locations.
- QQ. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- RR. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- SS. Install flush mounting box without damaging wall insulation or reducing the effectiveness.
- TT. Use adjustable steel channel fasteners for hung ceiling outlet box.
- UU. Do not fasten boxes to ceiling support wires.
- VV. Support boxes independently of conduit.
- WW. Use gang box where more than one device is mounted together. Do not use sectional box.
- XX. In other than masonry, use 4-inch square by 1-1/2 inch minimum box with plaster ring for single devices.
- YY. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- ZZ. Use cast floor boxes for installations in slab on grade. See plans for specialty A/V floorboxes equal to FSR. Coordinate cover trim with floor covering thickness and type.
- AAA. Set floor boxes level.
- BBB. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
 1. Interior Dry Locations: Use hinged enclosure.
 2. Other Locations: Use surface-mounted cast metal box.
- CCC. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.
- DDD. Boxes for light switches shall generally be located within 6 inches of door jamb.
- EEE. Pullboxes shall be provided at points shown on plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction. No runs of over 100 feet shall be made without use of pullbox.
- FFF. All boxes shall have covers. All boxes installed above a ceiling and installed in unfinished spaces (Mechanical and Electrical Rooms, etc.) shall have the covers clearly and legibly marked with the circuits contained within them.

- GGG. All flush-mounted boxes shall come within 1/4 inch of finished non-combustible surfaces and shall be flush with finished combustible surfaces. Install box extensions, if after rough-in and wall construction, the boxes do not come out far enough.
- HHH. Fireproof all poke-through devices in accordance with manufacturer's directions.
- III. Ground all boxes. Ensure that bonding breaks through paint to bare metallic surface.
- JJJ. Grind ears off of 2-gang boxes with isolated ground receptacles in each box. Grinding shall be done in a machine shop.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance of partitions and other elements.
- B. Pullboxes shall be provided at points shown on the plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction.
- C. All threaded conduit shall be secured to boxes, cabinets, panels, switches, etc. by means of a threaded bushing on the inside and locknuttred on the box exterior and interior.
- D. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- E. Coordinate mounting heights and locations of outlets mounted above counters, branches, and backsplashes with Architect prior to rough-in.
- F. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.03 THE FOLLOWING ARE PROHIBITED

- A. EMT crimp-on, tap-on, indenter type fittings.
- B. EMT set- screw fittings. Set-screw fittings on ends of flexible conduit are allowed.
- C. PVC inside buildings, or above grade.
- D. All thread nipples in other than dry locations.
- E. Wooden plugs inserted in concrete or masonry units as bases for fastening conduits, tubing, boxes, cabinets, or other equipment.
- F. Installation of conduit or tubing which has been crushed or deformed.
- G. Where conductors #8AWG or larger are inside, the following fittings shall not be used:
 - 1. 90° threaded hubs.
 - 2. Pulling elbows.

3. Bushed elbows.
 4. Short box connectors.
 5. 90° connectors.
 6. Entrance elbows.
 7. Types LB, LL, LR, T, L, TA, TB, X, LBD, or LBDN conduit bodies.
 8. Short elbows.
- H. Type ENT tubing.
- I. Armored cable.
- J. Metal-clad cable.
- K. EMT on roof, exposed, outside, in concrete, or underground.
- L. Flexible or liquidtight flexible conduits concealed in walls or floors.
- M. PVC elbows.
- N. Storage of PVC in sunlight.
- O. The use of heat to bend PVC conduit.
- P. Surface non-metal raceway.
- Q. Surface metal raceway in new buildings.
- R. Surface metal raceway in damp or wet locations.
- S. Flexible or liquidtight flexible conduits in lengths exceeding 6'-0".
- T. The use of external coverclips on surface metal raceway.
- U. All steel EMT fittings.
- V. Flexible conduit connectors on which the flexible conduit is threaded.
- W. Plastic boxes.
- X. Fiberglass boxes.

END OF SECTION 26 05 33

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL**1.01 SCOPE**

- A. The requirements for seismic protection measures to be applied to electrical equipment specified herein are in addition to any other items called for in other sections of these specifications. The seismic protection shall conform to Category D of the 2021 Arkansas Fire Prevention Code. The electrical equipment shall include the following items to the extent required on plans or in other sections of the following specifications:

Conduit, 2-1/2 inches or larger
Panelboards
Cable Trays
Switches
Light Fixtures
Switchboards
Communication Racks

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Basic Electrical Requirements - Section 26 05 00.

1.03 APPLICABLE PUBLICATIONS

- A. American National Standards Institute, Inc. (ANSI):
1. B18.2.1-1981
 2. B18.2.2-1972
- B. American Society for Testing and Materials (ASTM):
1. A36-84a
 2. A307-84
 3. A325-85
 4. A501-84
 5. A576-81
- C. Federal Specifications:
1. RR-W-410D
- D. NEMA
1. 250 Enclosures for Electrical Equipment
 2. IC56

1.04 REGULATORY REQUIREMENTS

- A. Conform to NFPA 70 - National Electrical Code and International Building Code.

B. Conform to 2021 Fire Prevention Code.

PART 2 - PRODUCTS

- 2.01** Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.
- 2.02** Sway brace of structural steel conforming with ASTM A36.
- 2.03** Mechanical couplings of the sleeve type to provide a tight flexible joint under all reasonable conditions.
- 2.04** Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and B12.2.2 and ASTM A307 or 306.
- 2.05** Guy wires where required shall conform to Fed Spec. RR-W-441 as follows:
- | | |
|-------------------------|-----------------|
| 5/32" diameter | Type V, Class 1 |
| 3/16" to 5/16" diameter | Type V, Class 2 |
| 1/4" to 5/8" diameter | Type I, Class 2 |

PART 3 - EXECUTION

- 3.01** All rigidly mounted equipment will have a minimum of four (4) anchor bolts securely fastened through bases or backs. Anchor bolts must conform to ASTM A307. Anchor bolts shall have an embedded straight length equal to at least twelve times the nominal diameter of the bolt and shall conform to the applicable tables for various equipment weights.

Maximum Equipment Weight (Pounds)	

500	1/2
1,000	1/2
5,000	1/2
10,000	1/2
20,000	1/2
30,000	5/8
50,000	3/4
100,000	1

Based on four (4) bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Use equivalent total cross-sectional area when more than four bolts per item are provided. Anchor bolts that exceed normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated. Expansion anchors shall not be used to resist seismic or vibratory loads unless test data are provided to verify the adequacy of the specific anchor and application. In no case shall the expansion anchor size be less than that required for bolts in the preceding table. Selection of anchor bolts for vibration isolation devices and/or snubbers to equipment base and foundations shall follow the same procedure, except that an equipment weight equal to five times the actual equipment weight shall be used. Vibration isolation devices shall be

selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

- 3.02** Equipment Sway Bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45-degree angle from the equipment frame to the building structure secured at both ends with no less than 1/2 inch bolts. Braces shall conform to all applicable codes and standards for Seismic Classification. Bracing shall be provided in two planes of directions, 90 degrees apart, for each item of equipment. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45-degrees, provided that supporting members are properly sized to supporting operating weight of equipment when inclined at a 45-degree angle.
- 3.03** All recessed fluorescent light fixtures shall have seismic clips firmly situated over tops of ceiling grid tees or plaster frames.
- 3.04** Sway bracing shall be provided for all 2-1/2 inch or larger conduits, not individually supported with hangers 12 inches or less in length.
- 3.05** All 2-1/2 inch or larger conduits entering or leaving a building or structure shall have a flexible seismic expansion fitting installed within the earth prior to entering the building or after leaving the building. Fitting shall be within 5'-0" of building or structure. Fitting shall be equal to Appleton Type DF.
- 3.06** All light fixtures that weight more than 50 pounds shall have a safety chain or safety cable in addition to its other support.
- 3.07** Sway bracing shall be provided for all cable trays.
- 3.08** Communications racks shall be bolted to floor. Tops of racks shall be bolted to walls.
- 3.09** Cable trays and conduits shall be independently supported and braced independently of the ceiling.
- 3.10** Powder-activated fasteners (shot pins) shall not be used for anchorage.
- 3.11** Vibration isolators shall have a bumper restraint in each horizontal direction, and vertical restraints shall be provided where required to resist overturning.
- 3.12** Internal coils of dry type transformers shall be positively attached to their supporting substructure within the transformer enclosure.
- 3.13** Slide-out components in electrical equipment shall have a latching mechanism to hold contents in place.
- 3.14** Electrical cabinet design shall conform to NEMA 250 and NEMA IC56.
- 3.15** The attachment of additional items weighing more than 100 pounds to electrical equipment is prohibited.

- 3.16** Friction clips shall not be used for anchorage attachments.
- 3.17** Oversized plate washers extending to the equipment wall shall be used at bolted connections through the base sheet metal if the base is not reinforced with stiffeners or not capable of transferring the required loads.

END OF SECTION 26 05 48

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Trench tape.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.03 RELATED SECTIONS

- A. Section 09 900 - Painting: Boxes.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

- B. Locations:
 - 1. Each electrical distribution equipment (switchboards, panelboards, enclosed circuit breakers, motor control centers, transformers) and control equipment enclosure (starters, disconnect switches, etc.).
- C. Letter Size:
 - 1. Use 1/2 inch letters for identifying equipment designation and voltage.
- D. Provide typewritten directory in each panelboard of circuit designations in clear/transparent protective envelope attached to inside of panelboard door.
- E. Provide typewritten zone directory in each conventional fire alarm control panel in clear/transparent, protective envelope attached to inside of central panel door.
- F. Provide nameplate on inside of each panelboard and main indicating color code scheme for the voltage of that panelboard and main, nameplates to be red with white characters.

2.02 WIRE MARKERS

- A. Description: Tape or tubing type wire markers.
- B. Locations: Each conductor at panelboard gutters switchboard gutters, motor control center gutters, pull boxes, outlet and junction boxes, disconnect switches, motor starters, and at each load connection.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.03 TRENCH TAPE

- A. Tape shall be detectable aluminum foil polyethylene laminate.
- B. Tape shall be the following color and have the following wording:

<u>Application</u>	<u>Color</u>	<u>Caution Wording</u>
Electrical	Red	“Caution – Electric Line Buried Below”
Fiber Optic	Orange	“Caution – Buried Fiber Optic Cable”

- C. Tape shall be equal to Panduit Type HTDU with width to match trench width.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using No. 4 round heat cadmium plated, steel self-tapping screws or nickel-plated brass plates.
- C. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.
- D. All fire alarm junction boxes and pullboxes shall be painted red where concealed or exposed in mechanical or electrical rooms.
- E. Both ends of pullwires shall be identified by means of labels or tags, reading "PULLWIRE" and shall be numbered to refer to same pullwire.
- F. Install nameplates at each circuit breaker on all switchboards and large panelboards.
- G. Install wire markers on wires in each junction box, panelboard, switchboard, control panel, etc.
- H. Install typewritten "COMPUTER" with black letters and clear background on each coverplate of receptacles adjacent to information outlets
- I. Install nameplates at each device within motor control centers.
- J. Install directory of addresses and corresponding devices and locations in each addressable fire alarm and security control panels.
- K. All security junction boxes and pullboxes shall be painted yellow where concealed or exposed in mechanical or electrical rooms.
- L. Install labels on all telephone and computer cables.
- M. All telephone junction boxes and pullboxes shall be painted white where concealed or exposed in mechanical or electrical rooms.
- N. Paint all data junction boxes and pullboxes blue where concealed or exposed in mechanical or electrical rooms.
- O. Paint all public address junction boxes and pullboxes dark gray where concealed or exposed in mechanical or electrical rooms.
- P. Paint all television cable junction boxes or pullboxes black where concealed or exposed in mechanical or electrical rooms.

END OF SECTION 26 05 33

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Branch circuit panelboards.
- B. Distribution panelboards.

1.02 RELATED SECTIONS

- A. Section 09 9 00 - Painting: Touchup.
- B. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Engraved nameplates.
- D. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

1.03 REFERENCES

- A. NECA (National Electrical Contractors Association) "Standard of Installation."
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA PB 1 - Panelboards.
- D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.
- E. NFPA 70 - National Electrical Code.
- F. UL 67 - Panelboards.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 RECORD DOCUMENTS

- A. Record actual locations of Products; indicate actual branch circuit arrangement.

1.06 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this Section.

1.09 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.11 MAINTENANCE MATERIALS

- A. Provide two of each panelboard key.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Square D.
- B. General Electric.
- C. Siemens/ITE.
- D. Cutler-Hammer.

2.02 PANELBOARDS

- A. Panelboards: NEMA PB1, circuit breaker type.

- B. Panelboard Bus: Tin-plated copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.
- C. Minimum short circuit rating, shall be as indicated on the Drawings. Panelboards shall have a fully rated interrupting rating. Series-rated equipment will not be accepted.
- D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- E. Enclosure: NEMA PB 1, Type 1, or 3R as indicated on the Drawings.
- F. Cabinet box: 6 inches deep; width: 20 inches for 240 volt and less panelboards.
- G. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.03 MODIFICATIONS TO EXISTING PANELBOARDS

- A. Provide and install all bus extensions, bus stabs, enclosures, etc. to install circuit breakers in existing panelboards.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb. Provide supports in accordance with Section 26 05 29.
- C. Install panelboards with middle at 48 inches, if less than 6'-6" tall. If panelboard is taller than 6'-6 inches, install with top at 7'-6".
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- G. Provide a minimum of four (4) spare 20A/1P circuit breakers in each branch circuit panelboard or as indicated on the drawings.
- H. Install all screws and bolts in coverplates.
- I. Install knockout plugs in all unused openings in enclosure.

- J. Install nameplates on all circuit breakers of large panelboards.
- K. Bolt panelboards to mounting surface in accordance with Section 26 05 48.
- L. Panelboards installed on basement walls or outside on exterior walls shall be installed on 1-1/2 inch channel.
- M. The first section of multi-section panelboards shall have feed-through lugs. Contractor shall install conductors with ampacities equal to the bus rating of the panelboards, from the feed-through lugs to the main lugs only of Section #2 panelboard.
- N. Touchup scratched or marred surfaces to match original finish.
- O. Neatly form wire inside of panelboard.

3.02 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections using calibrated torque wrench for circuit breakers, bus stabs, and busses.

END OF SECTION 26 24 16

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Arrangement with Utility Company for permanent and temporary electric services, including payment of Utility Company charges for service.
- B. Underground service entrance.
- C. Metering equipment.

1.02 RELATED SECTIONS

- A. Section 31 21 00 – Earth Moving.
- B. Section 31 23 23 - Backfilling.
- C. Section 31 23 16 - Trenching.
- D. Section 03 300 - Cast-In-Place Concrete for pad mounted transformers and/or free-standing C.T. cabinets.
- E. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- F. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- G. Section 26 05 29 – Hangers and Supports for Electrical Systems.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NETA – National Electrical Testing Association.

1.04 SYSTEM DESCRIPTION

- A. Utility Company: Entergy of Arkansas.
- B. System Characteristics: 240 volts, single phase, four- wire, 60 Hertz.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Utility Company written requirements.
- B. Maintain one copy of each document on site.

1.06 REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- B. Conform to the requirements of NFPA 70 - National Electrical Code, ANSI/IEEE C2 - National Electrical Safety Code, and Arkansas Public Service Commission rules and regulations.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Utility Company drawings.

PART 2 - PRODUCTS

2.01 UTILITY METERS

- A. Meters will be furnished and installed by Utility Company.

2.02 UTILITY METER BASES

- A. Meter bases will be purchased by Contractor from Utility Company and installed by the Contractor.

2.03 UTILITY CURRENT TRANSFORMER CABINET

- A. Current transformer cabinet shall be purchased by Contractor from Utility Company and shall be installed by Contractor per directions from Utility Company.

2.04 TRANSFORMER PAD

- A. Description: Concrete transformer pad with cable pit sized as indicated on Drawings.

2.05 GROUND GRID

- A. Stranded copper conductors, exothermic connections, and copper clad steel ground rods as directed by Utility Company.

2.06 LUGS

- A. Contractor shall provide lugs to the Utility to connect underground service conductors to pad-mounted transformer secondary terminals.

2.07 CONDUITS

- A. Above ground conduit shall be threaded rigid steel.

- B. Underground conduit shall be Schedule 80 with IMC elbows.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that service equipment is ready to be connected and energized.

3.02 PREPARATION

- A. Make arrangements with Utility Company to obtain permanent and temporary electric services to the Project.
- B. Coordinate location of Utility Company's facilities to ensure proper access is available.
- C. Pay all fees for electrical service to Utility Company.

3.03 INSTALLATION

- A. Install service entrance conduits and conductors from Utility Company's transformer to building service entrance equipment.
- B. Provide cast-in-place concrete pad and ground grid for Utility Company transformer and/or free-standing C.T. cabinet, under the provisions of Section 03 300.
- C. Provide buried PVC conduit from primary compartment of transformer pad to Utility Company's pole as directed by Utility Company.
- D. Install meter and current transformer cabinet as directed by Utility Company.
- E. Provide and install secondary lugs at transformer and lugs at current transformer cabinet.
- F. Level concrete pads.
- G. Dress up areas of excavation.
- H. Ground enclosures, current transformers, and meter.
- I. Install conduit hubs when exiting the top or sides of a NEMA 3R enclosure.
- J. Install weatherheads on ends of conduits for overhead services.
- K. Install meters, current transformer cabinets, and outdoor service equipment on 1-1/2 inch channels.

3.04 FIELD QUALITY CONTROL

- A. Torque lugs to NETA specifications.

END OF SECTION 26 20 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Occupancy Sensors.
- D. Device plates.

1.02 RELATED SECTIONS

- A. Section 26 05 33 - Boxes.
- B. Section 26 05 53 - Electrical Identification: Labels on computer outlets.

1.03 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. UL 20 - General Use Snap Switches.
- D. UL 498 - Attachment Plugs and Receptacles.
- E. UL 894 - Switches for Use in Hazardous (Classified) Locations.
- F. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, operation, and installation of product.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 EXTRA MATERIALS

- A. Provide protective rings and split nozzles as required and as specified.

PART 2 - PRODUCTS (NO SUBSTITUTIONS)

2.01 WALL SWITCHES

- A. Single Pole Switch:
 - 1. Hubbell #1221.
 - 2. Pass & Seymour #20AC1.
 - 3. Cooper Wiring Devices #2221.
 - 4. Leviton #1221.
- B. Double Pole Switch:
 - 1. Hubbell #1222.
 - 2. Pass & Seymour #20AC2.
 - 3. Cooper Wiring Devices #2222.
 - 4. Leviton #1222.
- C. Three-way Switch:
 - 1. Hubbell #1223.
 - 2. Pass & Seymour #20AC3.
 - 3. Cooper Wiring Devices #2223.
 - 4. Leviton #1223.
- D. Four-way Switch:
 - 1. Hubbell #1224.
 - 2. Pass & Seymour #20AC4.
 - 3. Cooper Wiring Devices #2224.
 - 4. Leviton #1224.

2.02 RECEPTACLES

- A. Single Convenience Receptacle:
 - 1. Hubbell #5361.
 - 2. Pass & Seymour #5361.
 - 3. Cooper Wiring Devices #5361.
 - 4. Leviton #5361.
- B. Duplex Convenience Receptacle:
 - 1. Hubbell #5362.
 - 2. Pass & Seymour #5362.

3. Cooper Wiring Devices #5362.
 4. Leviton #5362.
- C. GFCI Receptacle:
1. Hubbell #GF5352.
 2. Pass & Seymour #2091.
 3. Cooper Wiring Devices #XGF20.
 4. Leviton #GF5352.
- D. Isolated Ground Duplex Receptacle:
1. Hubbell #IG5362.
 2. Pass & Seymour #IG6300.
 3. Cooper Wiring Devices #IG5362.
 4. Leviton #IG5362.
- E. Special Purpose Receptacle:
1. Type, NEMA configuration and voltage as specified on Drawings as manufactured by:
 - a. Hubbell.
 - b. Pass & Seymour.
 - c. Cooper Wiring Devices.
 - d. Leviton.
- F. Color of devices as selected by Architect/Engineer.

2.03 OCCUPANCY SENSORS

- A. Approved Manufactures
1. Hubbell
 2. WattStopper
 3. Engineer approved
- B. Type: Sensors shall be “Dual Technology” unless otherwise noted on plans
- C. Installation
1. The Occupancy Sensor system shall sense the presence of human activity within the desired space and fully control the “On” / “Off” function of the lights.
 2. Time Delay settings shall be set at 10 minutes. This delay selection is based on lamp life vs. energy savings and sensor performance. Corridors and Bathroom time delay shall be set for 30 minutes to provide safety in such areas.
 3. Contractor shall adjust sensor sensitivity so the device will operate properly.
 4. Manufacture specified on drawings is specific to design. If an alternate manufacture is selected, the contractor is responsible for additional sensors, power pack, and additional equipment to meet the design needs. Also, contractor is to provide manufactures drawings with sensor coverage located on drawings. The revised drawing shall be included with the shop drawings. Alternate plan will only be approved once the engineer has reviewed this information.

2.04 WALL PLATES

- A. Cover Plates: Stainless steel.
- B. Weatherproof Enclosures:
 - 1. Receptacles in wet locations shall be installed with an outlet enclosure clearly marked "Suitable for Wet Locations While in Use". There shall be a gasket between the enclosure and the mounting surface, and between the cover and the base to assure proper seal.
 - 2. The enclosure must employ stainless steel mounting hardware and be constructed of impact resistant polycarbonate. The outlet enclosure shall be UL listed and shall be as manufactured by TayMac Corporation, or approved equal.
- C. Isolated Ground Receptacle/Computer Receptacle: Cover plates shall have "Computer" with black letters on clear background written from typewriter equal to Thomas & Betts at top of coverplate.
- D. Wall-mounted Occupancy Sensors: Coverplates shall be suitable for sensor type and shape.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- E. Verify color of all devices and coverplates.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install single and double pole switches with OFF position down.

- D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- E. Install plates on switch, receptacle, and blank outlets in all areas.
- F. Connect wiring devices by wrapping conductor around screw terminal in clockwise direction and tightening screw. Where wiring device has two (2) plates tightened by a screw, this method may be used. However, other back-connected wiring devices, which depend upon a metal spring action, are not allowed.
- G. Use jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings, and on surface mounted outlets.
- I. All plates shall be secured by means of screws with heads matching plates.
- J. Vertically mounted receptacles shall be installed with equipment grounds down, unless local codes require otherwise. Horizontally mounted receptacles shall be installed with equipment grounds to the right, unless local codes require otherwise. Regardless, all receptacles, including GFCI receptacles, shall be installed in the same way with the ground, turned in the same direction.
- K. Install labels on computer outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights specified and indicated on Drawings.
- B. Install wall switches 48 inches above finished floor to the center of the box.
- C. Install convenience receptacle 18 (vertically oriented) inches above finished floor unless noted otherwise on Drawings.
- D. Install convenience receptacle 6 (horizontally oriented) inches above finished counter.

3.05 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

F. Check tightness of all conductor connections.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION 26 27 26

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fusible switches.
- B. Non-fusible switches.
- C. Fuses.
- D. Enclosed circuit breakers.

1.02 REFERENCES

- A. ASME A17.1 - Safety Code for Elevators and Escalators.
- B. NECA (National Electrical Contractors Association) "Standard of Installation".
- C. NEMA AB 1 - Molded-Case Circuit Breakers.
- D. NEMA KS 1 - Enclosed Switches.
- E. NFPA 70 - National Electrical Code.
- F. UL 50 - Enclosures for Electrical Equipment.
- G. UL 98 - Enclosed and Dead-Front Switches.
- H. UL 198C - High Interrupting Capacity Fuses; Current Limiting Type.
- I. UL 198E - Class R fuses.
- J. UL 363 - Knife Switches.
- K. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.
- L. UL 1066 - Low Voltage AC and DC Power Circuit Breakers Used in Enclosures.
- M. UL 1332 - Organic Coatings for Steel for Outdoor-Use Electrical Equipment Enclosure.

1.03 RELATED SECTIONS

- A. Section 09 90 00 - Painting: Touchup.
- B. Section 26 05 29 – Hangers and Supports for Electrical Systems.

- C. Section 26 05 53 - Identification for Electrical Systems.
- D. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Disconnect switches shall be heavy duty, as manufactured by,
 - 1. Square D
 - 2. General Electric
 - 3. Siemens ITE
 - 4. Cutler-Hammer

2.02 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch, with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- B. Non-fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

2.03 ENCLOSED CIRCUIT BREAKERS

- A. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R, lockable.
- B. Minimum integrated short circuit rating as indicated on the Drawings shall be fully rated rating. Series-Rated equipment will not be accepted.
- C. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- D. Cabinet: Finish in manufacturer's standard gray enamel.
- E. 480Y277 volt main circuit breakers rated 1000 amperes or more shall have ground fault protection.

2.04 FUSES

- A. Manufacturers:
 - 1. Bussman.
 - 2. Gould-Shawmut.
 - 3. Little.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the electrical device where indicated.
- B. Install fuses in fusible disconnect switches.
- C. Install equipment ground bus in enclosed circuit breaker / switch.
- D. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- E. Provide label on outside cover as directed by Section 26 05 53 - Identification for Electrical Systems.
- F. Provide three (3) spare fuses of each type utilized.

- G. Bolt enclosed circuit breaker / switch to mounting surface in accordance with Section 26 05 29.
- H. Where wall-mounted circuit breaker / switches are mounted to be operated from floor or grade, install switch with middle of switch at 48 inches, if switch is less than 6'-6" tall. If switch is taller than 6'-6" tall, install switch with top of switch at 7'-6".
- I. When the electrical devices are installed on exterior basement walls or outside, the switches shall be mounted on 1-1/2 inch channels.
- J. Enclosed switches for wall-mounted exhaust fans installed higher than 8' from the floor, shall be installed high on the wall next to the exhaust fan.
- K. Install nameplate on disconnect switch with designation of equipment being served by switch. If main switch, install "Main Disconnect" nameplate.
- L. Touchup scratched or marred surfaces to match original finish.
- M. Connect elevator battery lowering device to auxiliary contact of elevator disconnect switch.
- N. Neatly form wires inside switches.

3.02 FIELD QUALITY CONTROL

- A. Check tightness of conductor lugs using calibrated torque wrench.

END OF SECTION 26 28 16

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Complete computer network system, including but not limited to:
 - 1. Conduit as specified in Section 26 05 33.
 - 2. Boxes as specified in Section 26 05 33.
 - 3. Cables.
 - 4. Outlets.
 - 5. Connections.
 - 6. Patch panels.
 - 7. Testing.
 - 8. 19-inch racks.
 - 9. Supporting devices as specified in Section 26 0529.

1.02 RELATED SECTIONS

- A. Section 09 91 00 - Painting: Field painting of backboards and cabinets.
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 – Hangers and Supports for Electrical Systems: Supports for conduits and backboards.
- E. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Provide post-manufacture test reports of all wiring and cables.
- C. Submit factory training certificates of all installers.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 - National Electrical Code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.
- C. The Arkansas Department of Labor requires that the worker, who installs the raceways for the equipment under this Section, be paid the electrician's minimum wage rate.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Division 1 and Section 26 05 00.
- B. Final payment will not be made unless, and until, the Contractor has provided “as built” drawings of all work performed.

1.06 QUALITY ASSURANCE

- A. Install work in accordance with ANSI/EIA/TIA 568A Category 6 Addendum (Draft 5 or latest).
- B. Contractor shall have experience in the installation of structured cabling systems. All installers assigned by the Contractor to the installation work shall have factory certification that they are qualified to install and test the products provided.
- C. Provide all test equipment used to conduct acceptance tests. Use only test equipment, which will produce a printed report of test results, which cannot be edited or manipulated by any means.
- D. The contractor is to provide all materials, labor and equipment necessary to install conduit and wiring, anchors, hooks, and ladder racks required for a fully functioning computer network system when terminated to the main and intermediate distribution frames (MDF/IDF) hubs, servers, patch panels, computers or other system terminals.
- E. Contractor shall warrant installation against all product defects, and that all approved cabling components meet or exceed the requirement of TIA/EIA-568A, TIA/EIA-568-A-A5, and ISAO/IEC 11801 for a period of one (1) year.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Network Cable: comCables CAT 6, 550Mhz, Plenum rated cable, unshielded, twisted pair, colors by owner, refer to the drawings. One color for cameras, one for data, one for WiFi, and one for security, for a total of 4 different colors.
- B. J-Hooks/Tri-hooks: Follow manufacturers printed instructions for installation. Support cable bundles at 4 feet on center maximum. Do not exceed 50% of hook. Maximum fill-50 cat 6 equal to cpi Rapid Trak J hook w/Velcro strap p/n 31422-801. Tri-hook pn 31424-808 max fill-150 cat 6.
- C. Cable pathway system – includes 10,000 series cable runway and all accessories. Equal to Chatsworth Product Incorporated, CPI.
- D. Chatsworth Racks: Wall mounted open 30U rack. Racks shall be 19” wide with E.I.A. Channel, equal to CPI. Racks shall have vertical and horizontal cable management.

- E. General Note: For any device used for cable support, whether J-hook, caddy straps, or ladders racks, do NOT exceed 50% of support capacity. Product submittals must include cable loading capacity information.
- F. Jacks and Coverplates – Jacks to match the CAT 6 Cable color, Everest Media Solutions CAT 6 rated. Coverplates to have windows with naming provided. Nomenclature to be provided by the owner. Cover-plate color by architect.
- G. Provide fasteners compatible with cable support system products. All anchors and fasteners must be attached to building frame.
- H. Patch Panels – Everest Media Solutions modular patch Panel” 48 port CAT 6 rated.
- I. Outlets: Combination data/communications outlets on this Project shall be as follows:
 - 1. Everest Media Solutions mount faceplate with high band RJ45 Key a tone jacks – 6 rated
 - 2. Faceplate labels (which designate network ID #) shall be marked as directed by the Owner.
 - 3. Each data outlet shall have 2 cables per location.

PART 3 - EXECUTION

- 3.01** Provide factory bends for all elbows on conduit. Do not install more than two (2) 90-degree bends without installing a pullbox. For conduit runs longer than 100'-0", install a pullbox. Where routing is above an accessible ceiling, conduit may be stubbed out from the wall box and turned horizontal above the ceiling and terminated with plastic bushing to protect emerging cable.
- 3.02** Contractor shall guarantee labor and materials for one year from date of acceptance.
- 3.03** No LB conduits shall be allowed.
- 3.04** If pull boxes are installed, they must be large enough to maintain a minimum bending radius for cables.
- 3.05** A complete set of "contractor revised" drawings of installation shall be provided upon completion of project.
- 3.06** Backboxes shall be mounted at 18 inches above the finished floor unless noted otherwise on the drawings.
- 3.07** Installer shall maintain the minimum distance from sources of electromagnetic interference: 6 inches from power circuits; 1 foot from fluorescent and HID lamps; and 4 feet from transformers, meters and variable frequency drives.
- 3.08** All raceway elbows shall be long radius elbows.
- 3.09** Install conduit where cables, not in conduit, pass through floors. Extend conduit at least

6 inches above top of floor.

- 3.10** Plenum rated cables shall be installed regardless if they are installed in air plenums or not.
- 3.11** Cables shall be continuous, without splicing, from patch panels to outlets.
- 3.12** Do not peel back cable sheath more than necessary to separate conductors.
- 3.13** Do not score copper conductors when peeling back conductor insulation. Scored conductors shall be replaced.
- 3.14** Do not bend cables with a radius less than five times the cable's diameter. Cables bent with a radius less than this shall be replaced.
- 3.15** Kinked, torn, or twisted cable sheaths are unacceptable and will be replaced.
- 3.16** Install cables to avoid water, high humidity, chemicals, cold temperature bending, pair spreading, pair wrapping, and different lengths of pairs in same cable.
- 3.17** Do not bundle more than 216 four-pair cables or 36 twenty-five pair cables.
- 3.18** Make sure conduits are properly terminated, reamed and brushed before installation of cable(s).
- 3.19** Do not crisscross pairs or allow them to become interwoven.
- 3.20** Verify proper conductor location at each termination before energizing.
- 3.21** Follow color code labels on individual pairs.
- 3.22** Cable sheaths shall be held in place by strain relief fittings.
- 3.23** Paint all junction boxes blue.
- 3.24** Bolt6 bottom of rack to floor and bolt top of rack to wall in accordance with Section 26 05 48.
- 3.25** Support all 2-1/2 inch or larger conduits and all cable trays in accordance with Section 26 05 48.
- 3.26** Install seismic flexible fitting on all 2-1/2 inch or larger conduits entering or leaving the building in accordance with Section 26 0548.
- 3.27** Install outlets at 18 inches above finished floor to center of outlet, unless noted otherwise on the Drawings.
- 3.28** Install outlets 6 inches above finished countertops to center of outlet.

3.29 Maintain the following clearances to cables:

- A. 6 inches from power circuits.
- B. 12 inches from light fixtures.
- C. 12 inches from hot water pipes, steam pipes and flues.
- D. 48 inches from transformers, meters, VFD's, and power correction systems.

3.30 WIRE ROUTING PENETRATIONS

- A. Provide by core drilling or other acceptable means a direct route between distribution frames and to individual devices to be served.
 - 1. Penetrations 1 inch and larger shall be sleeved.
 - 2. Grout sleeves in place using materials similar to wall construction.
- B. Floor to floor penetrations should not exceed 4-inch diameter cleanly drilled and properly fire safed.
 - 1. Fire Safing:
 - a. Install fire safing and sealant at all floor penetrations and at the top of all fire-rated partitions.
 - b. Install safing insulation and sealant at all cable penetrations and other pipe through openings between floor and in fire walls.
 - 2. Materials:
 - a. General: All products equal to "Therma Fiber" mineral fiber insulation as manufactured by USG Interiors, Inc., Chicago, Illinois.
 - b. 4 inch thick, unfaced, mineral fiber insulation, regular color. Federal specification HH-1-558BB, Class 1.
 - c. Sealing Compound: "Therma Fiber" smoke seal compound.
 - 3. Workmanship:
 - a. Install in accordance with manufacturer's printed instructions.
 - b. Stuff around wiring and wiring bundles passing through walls and floors full depth minimum 2 inches; top safing insulation with 2-inch-thick smoke seal compound.

3.31 Each network cable will be a home run from the room and each device to the intermediate distribution frame (IDF). Allow no splices between the IDF and the device served.

3.32 All cables exiting a room will be collected/bundled above corridor ceilings and travel along corridors to the IDF.

3.33 Cable bundles containing more than four cables will be supported by J-hooks installed not more than 4 feet on center.

3.34 Owner to provide and install concentrators and all electronic equipment.

3.35 Contractor shall test and certify proper operation of computer network cables.

3.36 Install cables in ceilings in workmanlike manner to permit service, maintenance or replacement of adjacent equipment without disrupting the position of the network cables.

3.37 Cable bundles must be secured via Velcro straps, do not use tie wraps.

3.38 INSTALLATION AT THE MAIN DISTRIBUTION FRAME OR THE INTERMEDIATE DISTRIBUTION FRAME

- A. Cables entering the MDF or IDF location will be placed on J hooks then ladder racks. Those devices will carry the network cable to the 19-inch racks where they will be terminated.
- B. Materials the contractor will install shall include Chatsworth racks, ladder racks, patch panels and optical fiber boxes.
- C. Terminate all network cables onto a patch panel. At patch panel terminations:
 - 1. Push pairs down in the cable slot against the block but not against the index strips.
 - 2. Keep pairs twisted up to termination.
 - 3. At patch panels, Velcro cable bundles.
 - 4. Terminate cabling to patch panels with lengths of cable sufficient to prevent binding on the brackets or angles of the rack.
 - 5. Provide a service ground at communication rack.

3.39 NETWORK CABLE IDENTIFICATION

- A. Every network cable installed will be labeled at the jack and on the patch panel. No label will be handwritten. Lettering on label will be ¼ inch tall. Labels located on faceplates will be black letters on a clear tape.
- B. Network cables will be labeled at the jack using the following system: IDF Floor. IDF Number. Patch Panel Letter. Patch Panel Port Number.
- C. Network Cables will be labeled on the patch panel with the room number the jack is terminated in.
- D. Each network cable will be given a circuit ID.
- E. The circuit ID will be assigned using the following system: Building Code. IDF Floor. IDF Number. Patch Panel Letter. Patch Panel Port Number. Room number the jack is in.
- F. The circuit ID will be used to identify network cables on any reports or documentation supplied by the contractor.

3.40 DOCUMENTATION OF CABLE PATHS

- A. Floor Plans:
 - 1. The contractor will be responsible for indicating J-Hook locations, network line paths, and optical fiber paths on one set of floor plans for each

building in an organized and legible manner.

3.41 POST-INSTALLATION TEST AND CERTIFICATION

- A. Quality Assurance:
- B. The contractor shall provide sufficient skilled labor to complete testing with the agreed upon test period. Testing shall commence prior to owner's acceptance of a finished building.
- C. The contractor shall have experience installing structured cabling systems. All installers assigned by the Contractor to the installation shall have factory certification that they are qualified to install and test the provided products.
- D. The contractor is responsible for supplying all of the required test equipment used to conduct acceptance tests.
- E. The contractor is responsible for submitting acceptance documentation as defined below.

3.42 TEST PROCESS

- A. The owner reserves the right to be present during any or all of testing.
- B. Testing shall be of the Permanent Link. However, Contractor shall warrant performance based on Channel performance.
- C. All cabling not tested strictly in accordance with these procedures shall be retested at no additional cost to the owner.
- D. 100% of the installed cabling must be tested. All tests must pass acceptance criteria.
- E. Test equipment shall be fully charged prior to each days testing.

3.43 STANDARDS COMPLIANCE AND TEST REQUIREMENTS

- A. Cabling must meet the indicated performance specifications:

Network line Specifications – Minimum Channel Standards

Frequency	550MHz	
Length	295	or lower
Propagation Delay	72%	or higher
Delay Skew	45 ns	or lower
NEXT	35.4 dB	or higher
NEXT @ Remote	35.4 Db	or higher
Attenuation	31.5	or lower
ACR	1.4 dB	or higher
ACR @ Remote	1.4 dB	or higher
PSACR	.04 dB	or higher

PSACR @ Remote	.04 dB	or higher
RL	10 dB	or higher
RL @ Remote	11 dB	or higher
PSNEXT	34 dB	or higher
PSNEXT @ Remote	35 dB	or higher
ELFEXT	15.8 dB	or higher
ELFEXT @ Remote	15.8 dB	or higher
PSELFEXT	12.8 dB	or higher
PLELFEXT @ Remote	12.8 dB	or higher

3.44 TESTING

- A. All documentation must be accompanied by a certificate signed by an authorized representative of the contractor and a current Registered Communications Distribution Designer (RCDD) warranting the truth and accuracy of the report.
- B. All tests must be performed using a Fluke DSP 4300 meter using permanent link adapters or approved equal.
- C. The contractor will ensure that each test performed has the correct network cable identification.

3.45 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted, and the owner is satisfied that all work is in accordance with contract documents.
- B. Acceptance Requirements:
 - 1. Contractor must warrant in writing that 100% of the installation meets the requirement specified under Standards Compliance and Test Requirements above.
- C. Owner reserves the right to conduct, using his own equipment and labor, a random re-test of up to five (5) percent of the cable plant to confirm documented results. Random re-testing can occur at any time during the warranty period. Any failing cabling shall be re-tested and restored to a passing condition. In the event more than two (2) percent of the cable plant fails during a re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the owner.
- D. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% Pass rating, and receipt of full documentation as outlined by the owner.

END OF SECTION 27 00 00

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Earthwork for this project includes but is not necessarily limited to:
 - 1. Layout of building and site improvements.
 - 2. Excavating for foundations, utilities and other below grade work.
 - 3. Filling and backfilling of all excavations.
 - 4. Rough and finish grading of the site.
 - 5. Granular drainage fill.
- B. Perform excavation regardless of type, nature or condition of materials encountered.
- C. There will be no extra compensation for dewatering.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
 - 1. Samples of all imported material. Provide 25 pound bags of material to Geotechnical engineer's office at least 10 days before the material is to be imported to the site.
 - 2. Samples of all on-site material to be used as fill.
 - 3. Certification that imported materials conform to the specification requirements along with copies of the test results from a qualified commercial testing laboratory.
 - 4. Proctor curves on fill material as prepared by approved laboratory.
- B. All fill material requires approval prior to placement.
- C. Substitutions will not be considered prior to the award of the General Contract.

1.04 JOB CONDITIONS

- A. Beginning work of this Section means acceptance of existing conditions.

- B. Dust Control: Control dust on and near the Work if dust is caused by Contractor's operations during performance of the Work or if resulting from condition in which Contractor leaves the site.

1.05 REFERENCES

- A. Arkansas State Highway and Transportation Department, Standard Specifications for Highway Construction, latest edition.
 - 1. AHTD Section 207 - Stone Backfill.
 - 2. AHTD Section 303 - Aggregate Base Course.
- B. ASTM International, 100 Barr Harbor drive, PO Box C700, West Conshohocken, PA 19428-2959, USA Phone: (610) 832-9585.
 - 1. ASTM D698 - Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12 in. Drop.
 - 2. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. Rammer and 18 in. Drop.
 - 4. ASTM D2216 - Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil-Aggregate Mixtures.
 - 5. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 6. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 7. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. AASHTO - American Association of State Highway and Transportation Officials
 - 1. AASHTO T 27 - Sieve Analysis of Fine and Coarse Aggregates.
- D. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P = Excavations.
- E. Arkansas Statute 291 of 1993.

1.06 DEFINITIONS

- A. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by the Standard Proctor Test, ASTM D698, or as determined by the Modified Proctor Test, ASTM D1557, as applicable. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Architect.
- B. Optimum Moisture Content: Moisture content of the material for which the maximum dry density is obtained as determined by ASTM D698 or D1557. Field moisture contents shall be determined on the basis of the fraction passing the 3/4" sieve.

- C. Completed Course: A course or layer that is ready for the next layer or the next phase of construction.
- D. Under-Cut: Additional excavation into native soils beyond sub-grade or stripping depth that is required to provide an adequate depth of suitable backfill bearing material.
- E. Sub-grade: The following shall define the sub-grade elevations:
 - 1. Footings: The elevation of the bottom of the footing.
 - 2. Building slabs: The elevation at the bottom of the capillary break.
 - 3. Walkways and Paving: The elevation at the bottom of the paving section.
 - 4. Utility Trenches: The elevation of the bottom of the pipe bedding.
 - 5. Landscaped Areas: The elevation below the stripping depth or the soil planting section, whichever is lower.
- F. Unsuitable material shall be that material below the sub-grade elevation that does not meet bearing capacity requirements as defined by the field Geotechnical engineer. Material not previously approved by Geotechnical engineer as unsuitable will not be considered for compensation.

1.07 UNSUITABLE MATERIAL

- A. The Contractor will be compensated beyond his base bid for excavation and off-site disposal of un-anticipated unsuitable soils only as verified and documented by the Geotechnical engineer in the field. No compensation will be made to the Contractor for unverified and undocumented quantities.
- B. Measure in-place bank yards of material that is to be removed by field measurement that shall be observed, verified, and documented by the Geotechnical Engineer prior to backfilling with imported Granular fill. Measurement by truck tickets will not be accepted. Measurement of excavation prior to backfilling will also be used to determine the quantity of excess import required to replace the excavated material.
- C. Soil integrity will be influenced by the weather conditions and the Contractor's handling and protection of the material as it is removed and placed. It is the sole responsibility of the Contractor to protect soils from the elements. The Contractor will be responsible for removing material, including previously inspected fill or exposed sub-grade, that is deemed unsuitable due to lack of protection and replacing with acceptable material at no additional cost to the Owner.
- D. Compensation will not be made for material that was not defined and verified in the field as unsuitable material by the Geotechnical engineer.

PART 2 - PRODUCTS

2.01 EARTH FILL

- A. Place earth fill in areas not designated to be structural fill or backfill.
- B. Free from roots, organic matter, trash and debris with maximum particle size of 1-1/2 inches.
- C. Imported fill is to consist of clayey sand (SC), sandy clay (CL) or clayey gravel (GC).
- D. Engineered fill is to consist of approved low volume-change material designated as CL or GC soils having a Liquid Limit less than 40 and a Plasticity Index less than 20 or Class 7 Aggregate Base Course.
- E. It is intended that fill be obtained from the site excavation to the maximum extent possible. DO NOT CONSTRUCT BORROW PITS ON SITE WITHOUT WRITTEN AUTHORIZATION FROM THE ARCHITECT.

2.02 STRUCTURAL (FLOWABLE) FILL

- A. Imported structural fill, Controlled Low Strength Material (CLSM), is to consist of a natural or artificial mixture of sand, coarse aggregate, cement and water, uniformly well graded from coarse to fine. The mix shall have good workability and flowability with self-compacting and self-leveling characteristics. Conform to ASTM D4832.
- B. Conform to the AHTD Section 303 classifications for Class 3, Class 4 or Class 7 as designated on the drawings. or as required by existing soil conditions.

2.03 UNDERSLAB DRAINAGE FILL

- A. Crushed stone or washed gravel, uniformly graded from 3/4" minimum size to 1-1/2" maximum size (ASTM C-33 #57 or equivalent).

2.04 CRUSHED SYENITE FILL

- A. Fill and Backfill Inside Building Walls: Crushed syenite, similar to Donna-Fill. Deliver to job in moist condition. Settle in place by completely immersing under water for optimum compaction. Keep water level above syenite at all times during placing.

2.05 TOPSOIL

- A. Selected topsoil from the site, properly stored and protected, free from roots, sticks, hard clay and stones which will not pass through a 1 in. square opening. Provide analysis of topsoil to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

- B. Provide imported topsoil of equal quality if required to accomplish the work.
 - 1. Natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. Obtain from naturally well-drained areas, without admixture of subsoil and free from Johnson grass (sorgam halepense), nut grass (cyprus rotundus), and objectionable weeds and toxic substances. Topsoil furnished shall be free from trash, brush, and stones over 1 inch in diameter, and related extra-neous material.
 - 2. Provide to Architect soil analysis including analysis for noxious weeds, nematodes, organic content and foreign matter. Conduct analysis using methods approved by the Association of Official Agricultural Chemists of the State Agricultural Experiment Station.
 - 3. Preliminary soils test may be conducted by Contractor for conditional acceptance by Architect. Shipping and delivery of topsoil may begin after acceptance of preliminary test findings, when acceptable. Conduct additional soils tests specified in soils testing lab.
- C. **Topsoil Removal:** Prior to the commencement of construction, the site shall be cleared of all vegetation in construction areas. After the site is cleared, all topsoil shall be stripped from the site and an adequate amount stored (4 inch minimum thickness) for reuse on the site for final seeding or landscaping. Excess topsoil may be used on embankment slopes or excavated slopes after final compaction of the embankment material or back-slopes. No topsoil shall be placed in areas to receive pavement, sidewalks or structures. Topsoil, because of its compressible organic content, shall not be used in areas that will support embankments, structures, or pavements. See Geotechnical Report for approximate stripping depths required.

2.06 COMPACTION EQUIPMENT

- A. Provide compaction equipment of suitable type and adequate to obtain the densities specified.
- B. Operate compaction equipment in strict accordance with the manufacturer's instructions and recommendations.
- C. Maintain equipment in such condition that it will deliver the manufacturer's rated compactive effort.
- D. Hand operated equipment shall be capable of achieving the specified densities.

2.07 MOISTURE CONTROL EQUIPMENT

- A. Provide equipment for applying water of a type and quality adequate for the work; it shall not leak and shall be equipped with a distributor bar or other approved device to assure uniform application.
- B. Provide equipment for mixing and drying out material consisting of blades, discs or other approved equipment.

2.08 WATER REMOVAL EQUIPMENT

- A. Provide and operate equipment adequate to keep excavation and trenches free of water, including but not limited to pumps and hoses.

2.09 SELECTED MATERIAL ACCEPTANCE

- A. Provide samples for testing representative of the actual material to be installed in the work. Take samples from material stockpiled. Depending on the uniformity of the material, Architect may request additional samples.
- B. Tests required at the borrow area:
 - 1. Standard Proctor.
 - 2. Atterberg limits.
- C. Forward test results to Architect at least 10 days before the material is required for use. If tests indicate that the material does not meet specification requirements, the material shall not be installed in the work.
- D. Material which is placed in the work but does not conform to the specification requirements shall be removed and replaced at the Contractor's expense.

2.10 AGGREGATE SURFACING

- A. Provide Class 7 Base (SB-2) – 1.5" minus w/fines.
- B. SB-2 is similar to limestone base but is harder, less dusty and less susceptible to tracking. It is primarily used in driveways, pathways, road bases, parking lots and pipe bedding. Excellent wet weather product.
- C. Provide Class 8 Base – 1" minus w/fines. This product has the same uses as Class 7 (SB-2).

2.11 OTHER MATERIALS

- A. Provide materials, not specifically described but required for proper completion of work of this Section, selected by Contractor subject to Architect approval.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

- A. Complete clearing and grubbing work as specified in Section 02 41 13 prior to beginning work in this section.

3.02 LAYOUT AND STAKING

- A. The Contractor will employ and pay a competent, independent, Registered Professional Land Surveyor with demonstrated ability to perform the layout work required.
- B. Definitions
 - 1. "Control Stakes" are the original reference points set by Engineer for the construction work.
 - 2. "Construction Staking" is an additional staking required as the project progresses which is the responsibility of Contractor.
- C. Engineer shall provide the following staking:
 - 1. Set temporary bench marks.
 - 2. Reset stakes found to be in error.
- D. Contractor shall provide the following staking:
 - 1. All construction staking except as provided by Engineer above.
 - 2. Reset stakes, marks or pins lost due to Contractor's operations.
- E. Electronic copies of surveying staking points will not be made available for this project.
- F. Control Staking
 - 1. Notify Engineer, in writing, at least five days in advance of the date when control staking services are desired.
 - 2. Engineer shall provide control staking.
 - 3. Examine stakes before commencing operations.
 - 4. Notify Engineer if validity of any control stake is questionable.
 - 5. Engineer will check stake or stakes in question.
 - 6. Any control stakes found to be in error will be reset by Engineer.
 - 7. If stakes are valid, Contractor shall pay for cost of checking stakes.
 - 8. Contractor shall inform his employees, subcontractors and vendors of importance of control stakes and the necessity of their preservation.
 - 9. Contractor shall pay for resetting any control stakes, marks, or pins lost due to Contractor's operations.
- G. Construction Staking
 - 1. Provide all construction staking as needed to complete the Work.
- H. If site conditions vary from those indicated, the Contractor shall notify the Architect immediately.

3.03 STRUCTURAL EXCAVATION

- A. Excavate subsoil required for building foundations both interior and exterior, construction operations and other work. Excavate for structures to the lines and grades shown or as required to accomplish the construction.

1. After excavating footings and prior to placing any fill material, Contractor is to arrange for qualified testing agency to perform hand held penetrometer tests at 10 foot intervals along entire length of perimeter footing and along all interior grade beams to determine that minimum soil bearing capacity has been achieved.
- B. The method of excavation used is optional; however, no equipment shall be operated within 5 feet of existing structures or newly completed construction.
- C. Excavation that cannot be accomplished without endangering present or new structures shall be done with hand tools.
- D. Machine slope banks to angle of repose or less until shored.
- E. Excavate to the depths and widths required.
- F. Do not interfere with normal 45 degree bearing splay of foundations.
- G. Allow for forms, working space, granular base and finish topsoil.
- H. Do not carry excavation for footings and slabs deeper than the elevation shown.
 1. Fill over excavations under footings with concrete of equal strength to that of the footing when excavations are deeper than the elevation shown.
 2. Replace excavation carried below the grade lines shown or established by the Architect with the same fill Material as specified for the overlying fill or backfill, compact as required for such overlying fill or backfill.
 3. Where the overlying area is not to receive fill or backfill, replace the over excavated material and compact to a density not less than that of the underlying ground.
 4. Correct over excavated areas and unauthorized excavation at the Contractor's expense.
- I. Correct cuts below grade by similarly cutting adjoining areas and creating a smooth transition.
- J. Hand trim excavation and leave free of loose matter.
- K. Remove lumped subsoil, boulders and rock.
- L. Stockpile excavated material in area designated on site and remove excess subsoil not being reused from site.

3.04 EXCAVATION SAFETY

- A. The Contractor shall be solely responsible for making the excavation in a safe manner.
- B. Provide appropriate measures to retain excavation side slopes to ensure that men working in or near the excavation are protected.

3.05 DEWATERING EXCAVATION

- A. Remove water during periods when concrete is being deposited, pipe is being laid and placing of backfill unless water settling is required and at such other times as required for efficient and safe execution of the work.
- B. Accomplish removal of groundwater in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes and will not result in damage to existing structures.
- C. Where necessary to these purposes, lower water level in advance of excavation, utilizing wells, wellpoints or similar methods.
- D. Maintain the water level in the gravel stratum as measured in piezometers, a minimum of 3 feet below the prevailing excavation.
- E. Open pumping, sumps and ditches: If these methods result in boils, loss of fines, softening of the ground or instability of slopes, they will not be permitted.
- F. Install wells and wellpoints with suitable screens and filters so that continuous pumping of fines does not occur.
- G. Operate well points continuously so as to prevent boils and loss of consolidation.
- H. Arrange discharge to facilitate collection of samples by Architect.
- I. Avoid settlement or damage to adjacent property.
- J. Dispose of water in a manner that will not damage adjacent property, as approved by Architect.

3.07 UNDERCUTTING

- A. Undercut areas on the site that do not meet the permeability requirements to such depth as to allow placement of sufficient impervious material as determined by permeability testing at borrow area as stated in Part 2 of this section.
- B. Prior to placement of fill in the undercut area, scarify the upper 6" of subgrade and re-compact to 95 percent of ASTM D1557.

3.08 FOUNDATION SUBGRADE PREPARATION

- A. After completion of excavation and prior to foundation or fill construction, proofroll the excavation surface with a loaded tandem-axle dump truck or similar heavy wheeled vehicle to detect soft or loose zones.
- B. Conduct proof-rolling in the presence of Architect.

- C. If soft or loose zones are found, excavate the material to a depth accepted by Architect, then fill and compact as specified for the overlying fills.
- D. Prior to placement of overlying fill or concrete, scarify the upper 6" of subgrade and re-compact the foundation subgrade to at least 95 percent of ASTM D1557.

3.09 FILL MATERIAL

- A. Place structural fill material within the influence area beneath all piping, slabs, structures and other areas of excavation.
- B. Place fill in 6" loose lifts and compact each lift to 95 percent of ASTM D1557.
- C. Moisten material as required to aid compaction (+ or - 2 percent optimum moisture content).
- D. Place material in horizontal lifts and in a manner which avoids segregation.
- E. Correct and repair subsequent damage to slabs, piping, concrete structures, facilities or other structures caused by settlement of fill material.

3.10 BACKFILL

- A. Remove form materials and trash from excavation before placing backfill.
- B. Do not operate earth moving equipment within 5 feet of walls of concrete structures for the purpose of depositing or compacting backfill material.
- C. Compact backfill adjacent to concrete walls with hand operated tampers or similar equipment that will not damage the structure.
- D. Place backfill material in 6" loose lifts and compact each lift to 95 percent of ASTM D1557.
- E. Backfill all utility excavations and compact to minimum 95 percent of ASTM D698.

3.11 SUBGRADE PREPARATION AND FILL MATERIAL AT PAVED AREAS

- A. Paved areas include areas to receive Gravel Surfacing, Asphalt Concrete Paving, Portland Cement Concrete Paving, etc.
- B. Scarify upper 6" of natural subgrade and recompact to 90 percent of ASTM D1557.
- C. Place structural fill material to the lines and grades shown in maximum 6" loose lifts and compact each lift to not less than 90 percent of ASTM D1557.

3.12 MOISTURE CONTROL

- A. During compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of fill.
- B. Maintain moisture content uniform throughout the lift.
- C. Add water to the material at the site of excavation. Supplement, if required, by sprinkling the fill.
- D. At the time of compaction, maintain the water content of the material at optimum moisture content, plus or minus 2 percent, except as otherwise specified for embankments.
- E. Do not attempt to compact fill material that contains excessive moisture.
- F. Aerate material by blading, discing, harrowing or other methods to hasten the drying process.

3.13 FIELD DENSITY TESTS

- A. Test Methods: ASTM D2922, D2216 and D3017.
- B. Cooperate with testing work by leveling small test areas designated by the Architect.
- C. Backfill test areas.
- D. Field density test shall be performed for every 50 cubic yards of fill material placed.
- E. Architect may order testing of any lift of fill at any time, location or elevation.

3.14 FINISH SITE GRADING AND TOPSOIL PLACEMENT

- A. **Finished Grading:** After all structures have been completed and all backfills have been compacted, all areas on the project construction site which have been disturbed by the Contractor shall be brought to true grade with a minimum of 4 inches of topsoil. Perform earthwork to lines and grades as shown with proper allowance for topsoil.
- B. Provide a minimum 4" depth of topsoil in all areas within the limits of construction that are disturbed during the course of this work except areas that are to receive sod or paving material.
- C. Shape, trim and finish slopes to conform with the lines, grades and cross sections shown.
- D. Make slopes free of loose exposed roots and stones exceeding 3 inches in diameter.
- E. Round tops of banks to circular curves, in general, not less than a 6 foot radius.

- F. Neatly and smoothly trim rounded surfaces; over excavating and backfilling to the proper grade are not acceptable.
- G. Finish site grading will be reviewed by Architect.

3.15 DISPOSAL OF EXCESS EXCAVATION

- A. Dispose of excess excavated materials, not required or suitable for use as backfill or fill off-site.
- B. Compact excess material as specified for fill, dress the completed disposal area to slopes no greater than 4:1 (horizontal:vertical) and slope to drain.

3.16 SETTLEMENT

- A. Settlement in backfill, fill or in structures built over the backfill or fill, which may occur within the 1-year guarantee period in the General Conditions will be considered to be caused by improper compaction methods.
- B. Restore structures damaged by settlement to original condition.

END OF SECTION 31 00 10

TRENCHING EXCAVATION, BACKFILL, AND COMPACTING**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Work of this Section also includes:
 - 1. Backfill required by undercutting.
 - 2. Imported pipe zone material.
 - 3. Trench settlement repair, including replacing roadway surfacing, sidewalk, or other structures.
 - 4. Replacing damaged culverts.
- B. Trench excavation is classified as common excavation and includes removal of material of whatever types encountered including rock to depths shown or as directed by Design Professional.
- C. Pipe zone includes full width of excavated trench from bottom of pipe to a point 6 inches above top outside surface of pipe barrel.
- D. Conform to federal, state, and local codes governing safe loading of trenches with excavated material.
- E. The right is reserved to modify the use, location, and quantities of the various types of backfill during construction as Engineer considers to be in the best interest of Owner.
- F. There shall be no extra compensation for dewatering. Contractor is to provide all necessary equipment including but not limited to pumps and hoses as needed to maintain the integrity of the site.
- G. There shall be no extra compensation for rock encountered in footing or trench excavation performed by standard heavy-duty equipment such as a Caterpillar D-8 dozer with single tooth ripper, a Caterpillar 330B tracked excavator equipped with rock teeth or equipment of similar power and capability. Rock not able to be excavated with this category of equipment will be compensated.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.

- B. All fill material requires approval prior to placement.
- C. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
 - 1. ASTM D448 - Classifications for Standard Sizes of Aggregate and Bridge Construction.
 - 2. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-inch Drop.
 - 3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10-lb. Rammer and 18-inch Drop.
 - 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.
 - 5. ASTM D2922 - Test Methods for Density of Soils and Soil-Aggregates in Place by Nuclear Method.
- B. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P = Excavations.
- C. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Arkansas Statute 291 of 1993.

PART 2 - PRODUCTS

2.01 FOUNDATION STABILIZATION

- A. Crushed gravel or crushed rock, meeting the requirements of Class 7 Aggregate Base.

2.02 PIPE ZONE MATERIAL

- A. Crushed granular material conforming to ASTM D448, Size No. 67, or Class 7.
- B. Washed stone bedding size 1/4-inch to 3/4-inch. In areas of soft trench sidewalls and for all sanitary sewer pipe zone material, crushed material must be used, compacted to 98 percent MDD, Standard Proctor.

2.03 COMMON FILL MATERIALS

- A. Material shall not contain pieces larger than 2 inches, and shall be free of roots, debris, or organic matter.

2.04 SELECT FILL MATERIAL

- A. Class 7, Class 3, and Class 4 as recognized by ASTM .

- B. ASTM Soil Classification GC as set forth in ASTM Designation D2487-92. On site material may be used, provided it is in accordance with ASTM D2487-92.

2.05 TRENCH BACKFILL

- A. Backfill:
 - 1. Natural or artificial mixture of gravel and mineral soil mortar uniformly well graded from coarse to fine.
 - 2. Engineered fill per Section 31 00 10.
 - 3. Class 3, Class 4, or Class 7 as recognized by ASTM and specified in this Section.
 - 4. All trench backfill under pavement or building is to be Class 7, compacted to 98 percent MDD, Modified Proctor.

2.06 COMPACTION EQUIPMENT

- A. Provide compaction equipment of suitable type and adequate to obtain the densities specified.
- B. Operate compaction equipment in strict accordance with the manufacturer's instructions and recommendations.
- C. Maintain equipment in such condition that it will deliver the manufacturer's rated compactive effort.
- D. Hand operated equipment shall be capable of achieving the specified densities.

2.07 EXCAVATION EQUIPMENT

- A. Suitable type and adequate to perform the work required. Rock removal will be considered common excavation if removable by standard heavy duty equipment such as a Caterpillar D-8 Dozer with a single tooth ripper, a Caterpillar 330B tracked excavator equipped with rock teeth or equipment of similar power and capability.
- B. Operate in strict accordance with manufacturer' s instructions and recommendations and maintain in such condition so that it will deliver manufacturer' s rated effort.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cut trees and brush as near to surface of ground as practicable, remove stumps, and pile for disposal.
- B. Do not permit excavated materials to cover brush or trees prior to disposal.

3.02 PREVENT TRENCH WATER AND ANIMALS FROM ENTERING PIPE

- A. When pipe laying is not in progress, including noon hours, open ends of pipe shall be closed; and no trench water, animals, or foreign material shall be permitted to enter the pipe.

3.03 DISPOSAL OF CLEARED MATERIAL

- A. Dispose of material in such a manner to meet requirements of state, county, and local regulations regarding health, safety, and public welfare.
- B. Dispose of nonflammable and flammable material off the construction site in an approved location.
- C. Do not leave material on the Project site, shove onto abutting private properties, or bury in embankments or trenches.

3.04 REMOVAL OF OBSTRUCTIONS

- A. Remove obstructions within trench area or adjacent thereto such as tree roots, stumps, abandoned piling, logs, and debris.
- B. Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made without adversely affecting the intended function of the facility.
- C. Dispose of obstructions in accordance with this Section.

3.05 REMOVAL AND REPLACEMENT OF TOPSOIL

- A. Where trenches cross lawns, garden areas, pasture lands, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove topsoil for a depth of 6 inches for full width of trench to be excavated.
- B. Use equipment capable of removing a uniform depth of material.
- C. Stockpile removed topsoil at regular intervals, and do not mix with other excavated material. Cover all stockpiled materials per Section 31 25 10 Erosion Control.
- D. Locate stockpiles so that material of one type is not mixed or stockpiled on material of another type.
- E. Minimum finished depth of topsoil over trenches: 8 inches.
- F. Imported topsoil may be substituted for stockpiling and replacing topsoil.
- G. Maintain finished grade of topsoil level with area adjacent to trench until final acceptance by Design Professional.

- H. Repair damage to adjacent topsoil caused by work operations.
 - 1. Remove rock, gravel, clay, and other foreign materials from the surface.
 - 2. Re-grade.
 - 3. Add topsoil as required.

3.06 TRENCH WIDTH

- A. Minimum width of un-shored trenches where pipe is to be laid shall be 18 inches greater than the outside diameter of the pipe, or as approved.
- B. Maximum width at top of trench will not be limited, except where excess width of excavation would cause damage to adjacent structures or property or cause undue stresses on the pipe.
- C. Confine trench widths to allowable work area or construction easements, unless special written agreements have been made with Owner.

3.07 EXCAVATION

- A. Excavate trench to lines and grades shown or as established by Engineer with proper allowance for pipe thickness and for pipe base or special bedding when required.
- B. If trench is excavated below required grade, correct with foundation stabilization material.
- C. Place material over full width of trench in compacted layers not exceeding 6 inches deep to established grade with allowance for pipe base or special bedding.

3.08 PREPARATION OF TRENCH - LINE AND GRADE

- A. Do not deviate more than ½ inch from line or ½ inch from grade. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.
- B. Grade the bottom of the trench by hand to the line and grade where the pipe is to be laid, with proper allowance for pipe thickness and for pipe base when specified or indicated.
- C. Remove hard spots that would prevent a uniform thickness of bedding.
- D. Check the grade with a straightedge and correct irregularities found.
- E. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.09 SHORING OF TRENCH LINES

- A. Shore trench when necessary to prevent caving during excavation in unstable material or to protect adjacent structures, property, workers, and the public.
- B. Increase trench widths accordingly by the thickness of the shoring material.
- C. Maintain shoring in place until pipe has been placed and backfilled at pipe zone.
- D. Remove shoring and as backfilling is done in a manner that will not damage pipe or permit voids in backfill.
- E. Conform to safety requirements of federal, state, and/or local public agency having jurisdiction for shoring and bracing of trenches. The most stringent of these requirements shall apply.

3.10 LOCATION OF EXCAVATED MATERIALS

- A. Place excavated material only within construction easement, right-of-way, or approved working area.
- B. Do not obstruct private or public traveled roadways or streets.

3.11 REMOVAL OF WATER

- A. Provide and maintain ample means and devices to promptly remove and dispose of water entering trench during time trench is being prepared for pouring of footings, pipe laying, during laying of pipe, and until backfill is completed.
 - 1. These provisions apply during the noon hour as well as overnight.
 - 2. Provide necessary means and devices, as approved, to positively prevent water from entering the construction area of another contractor.
- B. Dispose of water in a manner to prevent damage to adjacent property.
- C. Drainage of trench water through the pipeline under construction is prohibited.

3.12 FOUNDATION STABILIZATION

- A. When existing material in bottom of trench is unsuitable for supporting pipe or footing, excavate unsuitable material.
- B. Backfill trench to sub-grade of footing or pipe base with foundation stabilization material specified.
- C. Place foundation stabilization material over the full width of trench and compact in layers not exceeding 6 inches deep to required grade by making passes with a vibratory compactor (or equivalent).

- D. Material shall be considered unsuitable when it contains more than 5 percent organic material by volumetric sampling or when it will not support a reading of 1.5 on a hand penetrometer.

3.13 ROCK IN TRENCH

- A. Where rock is encountered in bottom of pipe trench, support pipe on a minimum of 4-inches of bedding material or one-eighth of the outside diameter of pipe, whichever is greater.
- B. Where rock is encountered in bottom of footing trench, excavate rock as needed to provide level bearing surface for footing.

3.14 PIPE ZONE BACKFILL

- A. Depth of the pipe zone above pipe barrel varies with pipe material.
- B. Particular attention must be given to area of pipe zone from invert to centerline of pipe to ensure firm support is obtained to prevent lateral movement of pipe during final backfilling of pipe zone.
- C. Backfill area of pipe zone from bottom of pipe to horizontal centerline of pipe by hand-placing material around pipe in 4-inch layers.
- D. Achieve continuous support beneath pipe haunches by “walking in” and slicing with shovel.
- E. Backfill area of pipe zone from horizontal centerline to top of pipe zone with pipe zone material as determined by class of backfill or shown in the documents.
- F. In lieu of selected material for pipe zone in upper portion of pipe zone, imported pipe zone material approved by Engineer for trench backfill may be substituted.

3.15 TRENCH BACKFILL ABOVE PIPE ZONE

- A. When backfill is placed mechanically, push backfill material onto slope of backfill previously placed and allow to slide down into trench.
- B. Do not push backfill into trench in such a way as to permit free fall of material until at least 2 feet of cover is provided over top of pipe.
- C. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.
- D. Do not use backfill material of consolidated masses larger than ½ cubic foot.

3.16 EXCESS EXCAVATED MATERIAL

- A. Dispose of excess excavated material off project site in an approved area.

3.17 PIPE COVER

- A. Place select material from excavation over pipe to provide minimum coverage, as shown on Drawings or as directed by Design Professional.

3.18 DRAINAGE DITCH RESTORATION

- A. Under-crossings of minor drainage ditches not covered in another Specification Section shall be backfilled so that upper 1 foot of material in ditch between ditch banks is clay.
- B. Compact material for full ditch width by 6 passes of vibratory compactor (or equivalent).

3.19 SETTLEMENT

- A. Correct settlement noted in backfill, fill, or in structures built over backfill or fill within warranty period.

END OF SECTION 31 23 10

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The contractor is responsible for implementing Erosion Control measures in accordance with State and Federal requirements. The information provided on the Drawings should be considered a minimum for the anticipated construction and conditions. The contractor shall be responsible for adding additional measures as conditions change, at no additional cost to the Owner, as required by the design professional if warranted by site conditions and Contractor's maintenance of site. Additional straw mulch, silt fencing and rip-rap shall be stockpiled on site to quickly maintain or expand erosion control measures as needed due to changing weather and site conditions.
- B. This Section includes the following:
 - 1. Silt fence, diversion ditches and rock ditch checks.
 - 2. Rock protection at ditch and pipe outfalls (Quarry Spalls, i.e., "Rip-Rap")
 - 3. Surface stabilization (seed, sod, poly-ethylene sheeting)
 - 4. Measures to keep streets clean.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 DESIGN REQUIREMENTS

- A. Provide temporary application of mulch cover as a deterrent to soil erosion.
- B. Provide baled straw between project earthwork operations and adjacent areas to prevent scouring, and eroding of soil, and silt runoff.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Mulch Cover: Straw from threshed rice, oats, wheat, barley or rye; of wood excelsior; or from hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue or other legumes or grasses, or a combination thereof. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.
- B. Straw Bales: Straw for barrier bales shall consist of bales of rice, oat, barley, wheat or rye straw or of available grasses free of an excessive amount of noxious weeds. Bales shall weigh approximately 35 pounds. Straw in an advanced state of decomposition will not be acceptable.
- C. Filter Fabric: Typar 3401, Trevira S1115, or approved equal non-woven polypropylene or polyester fabric.
- D. Silt Sock (Filter Sock): A three-dimensional mesh tube filled with organic material—typically compost or wood chips—used to control erosion, manage stormwater runoff, and trap sediment on construction sites. Placed along perimeters or around drains, they allow water to pass through while filtering out over 90% of sediment. Silt Socks provided by SRW Products, (800) 752-9326 or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Ensure that earthwork and final grading in area requiring erosion control have been brought to grade as required by Contract Documents.

3.02 INSTALLATION

- A. Straw Bale Filter: Tightly bound straw bales embedded at least 4 inches into soil and each bale held in place by 2 stakes driven at least 18 inches into ground. Bales shall tightly abut adjacent bales. Strings shall not touch the ground.
- B. Silt Fence: Fence post spaced no more than 10 feet apart and driven a minimum of 2 feet into ground. Post shall extend minimum of 2 feet above grade. Fasten metal mesh fence with 6 inch or smaller openings to fence posts to reinforce the silt fence fabric. Mesh fence to extend 2 feet above grade and 4 inches into grade. Mesh may be omitted if reinforced silt fence fabric is used or in areas of low flow.
- C. Non-vegetative Soil Stabilization: Utilize temporary non-vegetative soil stabilization to provide protection against excessive soil erosion over a short period of time. Required in areas that experience high water flows and high runoff velocities and at disturbed slopes steeper than 2:1.
 - 1. Mulch: Apply at 1.5-2.5 tons per acre.
 - 2. Anchor by peg and twine, mulch netting, erosion control, fabric, jute matting or mulch anchoring tool.

END OF SECTION 31 25 00

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PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform foundation and under floor termite control treatment in accordance with the Arkansas Pest Control Law and to qualify construction under this Contract for continuous guaranteed protection specified.
 - 1. Reference is made to Section IIIA - Minimum Requirements on Structural Pest Work on Existing Structures.
- B. Applicable Regulations:
 - 1. International Building Code
 - 2. Arkansas Pest Control Law, A.C.A. 17-30-101 et. Seq. and Regulations
 - a. Circular 6 revised December, 2013
 - b. Arkansas State Plant Board
 - 3. Federal Insecticide, Fungicide and Rodenticide Act, (Public Law 92-516 of Oct. 21, 1972 as amended by Public Law 100-532, October 25, 1988).

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.
- C. Submit a Termicide Application Plan, including Product Data, Design Data, Test Reports and Certificates.

1.04 GUARANTEE

- A. Furnish damage guarantee with service and re-service for any subterranean termite infestation without cost to Owner. Write Damage Guaranty Contract additionally to cover any and all subterranean termite damage to the structures and contents in amount of \$10,000. Such damage to be repaired, replaced or corrected at Contractor's expense.

- B. Furnish damage guarantee effective for 5 year period after completion of initial treatment without payment of additional fees or premiums by Owner. Upon expiration of 5-year period, Owner has option of extending damage guarantee contract at an annual fee mutually agreed upon by Owner and applicator. Owner reserves the right to cancel as of any anniversary date. Service, re-service, and Damage Guaranty provisions of the extended damage contract are noncancellable by applicator. Annual fee subject to revision by giving advance written notice to Owner.
- C. Include in the warranty annual inspections of the buildings, whether new or renovated, or building additions during the warranty period. If live subterranean termite infestation or subterranean termite damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim:
 - 1. Re-treat the site and perform other treatment as may be necessary for elimination of subterranean termite infestation;
 - 2. Repair damage caused by termite infestation; and
 - 3. Reinspect the building approximately 180 days after the re-treatment.

1.05 ADMINISTRATIVE

- A. Coordinate work related to final grades, landscape planting, foundations, or any other alterations to finished or renovated construction which might alter the condition of treated soils with this specification.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Chemical termite control uses liquid termiticide treatments applied to the soil, forming a continuous chemical barrier in the soil around both sides of the foundation. The application may be surface applied or rodded and trenched. This barrier prevents foraging termites from reaching the foundation and piers. Only the soil adjacent to these foundation elements is treated. For slab construction (including foundations, patios and garages), the entire soil (or gravel) surface shall be treated after tamping (Rodding method) and before the vapor barrier is installed and the slab poured over it. Soil treatment shall be coordinated with all building activities from foundation construction through final grading of the soil around the building's exterior. In order for the treatment to be effective, the final phase of the application must be done after final grading and, where required, after landscaping is completed so that treated soil is not disturbed.
 - 1. If tamping not utilized then broadcast spraying method over lightly scarified or loose ground surface is allowable. Verify with insecticide manufacturer.

2.02 TERMITE CONTROL CHEMICALS

- A. Use chemicals approved by the Arkansas State Plant Board and of type required to give guaranteed protection specified.

- B. Approved chemicals.
 - 1. Bifenthrin - 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.

PART 3 - EXECUTION

3.01 PREPARATION

- A. From investigation at the site determine soil texture or otherwise obtain this information from the County Agent, Soil Conservation Service or other approved authorities, if not already known.
- B. Eliminate food sources by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.02 TREATMENT

- A. Perform foundation and under floor termite control treatment at buildings to be constructed and/or renovated under this Contract. Use type chemical approved by the Arkansas State Plant Board and currently known to give guaranteed protection for the soil and fill used at this Project. Apply chemical using applicator licensed by the Arkansas State Plant Board. Apply in sufficient quantity under and around the structures, to qualify building and contents for continuous guaranteed protection against damage by subterranean termites.
- B. Reapply soil treatment solution to areas disturbed by subsequent excavation or construction activities following application.
- C. **Under New Slabs:** Apply under slabs at the rate recommended by manufacturer. Apply after placement of gravel drainage fill and immediately prior to placement of vapor barrier. When necessary to insure proper penetration, the ground surface may be left loose or lightly scarified until treatment has been completed. Coordinate with general contractor or construction manager and relative subcontractors. **OMIT BELOW IF NEW PROJECT**
 - 1. **Existing Slab Construction:** Treatments should be made when swarms occur or damage is found, or as a preventive measure.
 - a. Treatment under the slab is accomplished by drilling holes in the slab or foundation through which chemical can be applied in accordance with label directions to establish a barrier in the soil. Long-rodging can sometimes be accomplished without drilling.

- b. Brick and stone veneer on slab construction is treated by drilling through the veneer and injecting the void between the veneer and the slab with chemical. Brick and stone veneer shall be treated with approved chemicals according to the label directions. If the label directions require drilling and treating and the maximum interval requirements are not specific, the intervals at which the operator drills to achieve adequate barriers shall be stated on the graph. In such cases if the maximum intervals are not stated on the graph the operator will be required to drill and treat at a maximum of 18 inch intervals.
- D. Critical Areas: Treat a one foot strip along critical areas under walls, around interior piers and pipes rising from the ground at the rate recommended by manufacturer. Treatment shall be applied as specified for overall treatment under slabs.
- E. Outside of Foundations: Apply a one foot strip along the outside of the foundations of the building at the rate recommended by manufacturer. Apply in a trench dug to a depth of approximately 2" below finish grade. Loosen earth in trench to a depth of 12" before treating. This treatment is to be performed prior to finish grading.
 - 1. If the exterior perimeter treatment is applied when the horizontal barrier is applied it will be damaged or removed before construction is completed. The exterior foundation perimeter treatment will have to occur in phases when any pads, porches, aprons, sidewalks, final grading or landscape planting are simultaneously involved adjacent to the building foundation. This treatment area should be coordinated after all major construction but before any pads, porches, or other items requiring special consideration are poured adjacent to the foundation walls. Submit written verification that final grading, landscape planting and other items adjacent to the foundation will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

3.03 UTILITIES AND VENTS

- A. Turn off and block HVAC ducts and vents located in treatment area prior to application, to protect people and animals from termiticide. Submit written verification that the HVAC ducts and vents, water and sewer lines, and plumbing have been turned off or blocked prior to applying termiticide.

3.04 CRAWL AND PLENUM AIR SPACES

- A. Submit written verification that crawl and plenum air spaces have been located and identified prior to applying termiticide.

3.05 APPLICATION PLAN

- A. Prior to commencing application of termiticide, submit a Termiticide Application Plan addressing the following items:
 - a. proposed sequence of treatment work including dates and times of application
 - b. termiticide trade name

- c. EPA registration number
- d. chemical composition
- e. concentration of original and diluted material
- f. formulation
- g. manufacturer's recommended application rates
- h. regional requirements
- i. application rate of active ingredients
- j. method of application
- k. area or volume to be treated
- l. amount to be applied
- m. copy of the pest control business license
- n. copy of the pesticide applicator certificates

3.06 APPLICATION

- A. For areas to be treated, establish complete and unbroken vertical and horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Make applications to crawl spaces in accordance with label directions. Applications to crawl space areas that are used as plenum air spaces will not be permitted.

3.07 EQUIPMENT CALIBRATION AND TANK MEASUREMENT

- A. Submit a list of equipment to be used. Conduct calibration test on the application equipment to be used immediately prior to commencement of termiticide application. Measure the volume and contents of the application tank. Testing must confirm that the application equipment is operating within the manufacturer's specifications and meets the specified requirements. Submit written certification of the equipment calibration test results within 1 week of testing. Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

3.08 FIELD QUALITY CONTROL

- A. Verification of Measurement
 - 1. Once termiticide application has been completed, measure tank contents to determine the remaining volume. The total volume measurement of used contents for the application must equal the application rate established in the application plan. Submit written verification that the volume of termiticide used meets the application rate established in the application plan.
- B. Inspection
 - 1. Technical Representative: Provide a technical representative who is a certified pesticide applicator. The technical representative must be present at all meetings concerning treatment measures for subterranean termites and during treatment application.

3.09 CLOSEOUT ACTIVITIES

- A. Upon completion of this work, submit the Pest Management Report, or an equivalent computer product, to the contractor. This form shall identify the target pest, type of operation, brand name and manufacturer of pesticide, formulation, concentration or rate of application used.

3.10 PROTECTION OF TREATED AREA

- A. Immediately after the application, protect the area from other use by erecting barricades as required or directed, including signage. Place signage inside the entrances to crawl spaces and identify the space as treated with termiticide and not safe for children or animals. Cover treated areas with plastic if slab is not to be poured immediately following termiticide application.
- B. Disturbance of Treated Soils
 - 1. Re-treat soil and fill material disturbed after treatment before placement of slabs or other covering structures.

END OF SECTION 31 31 16

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare pavement in accordance with this specification. Construct work of this section that is adjacent to or connected to city streets in accordance with requirements of the city for city streets. This section covers the materials and procedures used in the repair of asphalt roads, streets, or other public rights-of-way where a water lines, sewer line, or structure is constructed.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 RELATED WORK

- A. Section 31 23 10 - Trenching Excavation, Backfill and Compacting.

1.05 REGULATIONS AND STANDARDS

- A. All permanent repairs of streets, roads, sidewalks, other public rights-of-way, private drives, private parking lots, etc. shall comply with the requirements shown on the Standard Detail Drawings and Tables. The Contractor is responsible for following the requirements of all local Ordinances, Regulations, or Codes governing the repairs to roads, streets, or other public rights of way. In particular:
 - 1. Repair of State Highways: per requirements of the Arkansas State Highway Commission.
 - 2. Repair of county roads: per requirements of the County Roads Department.
 - 3. Repair of municipal streets, sidewalks, and driveways: per the requirements of local governmental agency having jurisdiction.
 - 4. Permit for street cut and repairs shall be furnished by the Contractor.
 - 5. Contractor shall secure permits and inspections, post necessary bonds, and pay necessary fees.

- B. Temporary Repairs: Per requirements of the governmental agency having jurisdiction and these specifications. Must provide a minimum of a cold mix temporary patch.

1.06 TESTING, OBSERVATION, AND INSPECTION REQUIREMENTS

- A. Testing and inspection is required for pavement repairs in accordance with all local Ordinances, Regulations, or Codes governing the repairs. The inspection of street repairs shall be coordinated with the governmental agency having jurisdiction to ensure compliance with all applicable standards.
- B. Gradation of stone materials shall be performed in accordance with ASTM C136.
- C. The Contractor shall provide at least 24 hours of advance notice for any concrete or asphalt placement.

PART 2 - MATERIALS

2.01 BASE COURSE MATERIALS

- A. Base Course: Conform to AHTD Standard Specifications for Highway Construction, Section 303, Class 7.

2.02 ASPHALT MATERIALS

- A. Prime Coat: Medium curing cut-back asphalt; MC-30 or MC070; AASHTO M82; heated and applied within the temperature range 80 degrees F – 150 degrees F.
- B. Hot mix surfacing material shall meet the following requirements: Asphalt Cement Hot Mix Surface Course (1/2-inch) in accordance with Section 407 of the AHTD Standard Specifications for Highway Construction.

PART 3 - EXECUTION

3.01 GENERAL

- A. Asphalt surfaces for pavements, streets, roads, driveways, parking lots and walks shall be repaired with hot mix asphalt. Minimum thickness of asphalt surface replacement shall be 3-inches. The finished surface shall match and shall be level with surrounding pavement.
- B. Before replacing paved surfacing, the existing pavement shall be cut, sawed, or trimmed along straight and vertical lines along each side of the trench.
- C. Temporary repairs (if required) to paved surfaces shall be made with cold mix asphalt to allow access. Final repairs shall be made within 60 days weather permitting. Driveways shall be maintained to allow access during all weather conditions.

3.02 EXCAVATION AND BACKFILL

- A. Excavate and backfill in accordance with Section 31 23 10 - Trenching Excavation, Backfill and Compacting.

3.03 SUBGRADE PREPARATION

- A. Subgrade for asphalt paving improvements shall have all excess material including cold mix asphaltic concrete, soil, organic silty and clayey topsoils and other unsuitable material removed and replaced with approved material.
- B. The base surface on which the replacement material is to be placed shall be finished smooth and any wet material or debris shall be removed.
- C. Fill and compact utility trenches.
- D. Replace soft spots as required.

3.04 BASE COURSE FOR ASPHALTIC PAVING

- A. A concrete slab 6 inches in thickness and reinforced with #4 reinforcement bars placed at 12 inches on center each way shall be poured with the finished top of the slab extending to a point 2 inches below the finished surface. A bituminous tack coat shall then be applied to the concrete surface at a rate of 0.03 to 0.10 gallons per square yard. After proper curing of the tack coat, asphalt concrete hot mix surface course shall be placed with a compacted thickness of 2 inches and rolled with a steel wheeled roller to a minimum density of 92% of maximum density by Modified Proctor method.
- B. Place material on prepared subgrade in accordance with details shown on the Drawings.
 - 1. Spread base course the same day the material is hauled. It shall be thoroughly mixed, either by repeated handling with a blade grader or by harrowing sufficiently to secure a uniform mixture of coarse and fine particles.
 - 2. Compact base course by systematically rolling and watering as required to obtain a firm, uniform, smooth surface as specified in Division 300 of AHTD Standard Specifications for Highway Construction. Base course shall be compacted in 8-inch lifts. Prime coat shall not be put down until base course is compacted. Apply emulsified tack coat to all existing surfaces.
 - 3. After acceptance of completed base course, a prime coat shall be uniformly distributed over the prepared base, including vertical edges, at the rate of 0.4 gallons per square yard. Remove surplus asphalt material.
- C. Minimum density shall be 95 Percent Standard Proctor (ASTM D698).

3.05 ASPHALT PAVEMENT REPAIRS

- A. Asphalt pavement shall be replaced in accordance with details shown on the Drawings and all materials shall be furnished and installed in accordance with the Arkansas Highway and Transportation Department “Standard Specifications for Highway Construction.” Before replacing paved surfacing, the existing pavement shall be cut, sawed, or trimmed along straight and vertical lines. The condition of the backfill and base course material, with special regard to the degree of compaction, may be checked and approved by the governmental agency having jurisdiction before any surfacing is replaced.
- B. All street repairs shall require a “tee” patch, a minimum of 2’ wider than the trench width in accordance with the Standard Details.
- C. Trenches shall be backfilled with Class 7 base material compacted to 95% Modified Proctor Density.
- D. Before placement of new surface material, all excess material shall be removed to a minimum depth of nine (9) inches. A minimum of six (6) inches of 4,000 psi concrete shall be placed within three (3) inches of the street surface. Before placing asphalt, the concrete and sides of the cut shall be primed with MC-30 at the rate of 0.3 gallon per square yard.
- E. Minimum thickness of asphalt surface replacement shall be three (3) inches, unless shown otherwise. Hot mix asphalt material shall be delivered to the site in covered vehicles, at 275 deg-F (minimum), and immediately spread to a thickness to match adjacent surfaces after rolling. Compaction shall be by steel-wheel roller to a smooth, uniform surface matching adjacent surfaces.
- F. Paved parking lots disturbed or damaged in the process of construction shall be replaced in kind. Parking lots shall be replaced to same thickness as original but in no case less than 4-inches thick. Joint system in replacement shall be at same style and interval as that in the undisturbed parking lot.
- G. Paved concrete walkways disturbed or damaged in the process of construction shall be replaced in kind. Parking lots and walkway shall be replaced to same width and thickness as original but in no case less than 4-inches thick. Joint system in replacement shall be at same style and interval as that in the undisturbed walkway.
- H. Paved driveways disturbed or damaged in the process of construction shall be replaced in kind. Driveway shall be replaced to same width and thickness as original but in no case shall the asphalt be less than 3-inches thick.
- I. Concrete curbs disturbed or damaged in the process of construction shall be replaced in kind. Curbs shall be replaced to same width and thickness as original. Joint system in replacement shall be at same style and interval as that in the undisturbed curb.

- J. Any settlement or failure of surface replacement shall be repaired or replaced by the Contractor.
- K. All pavement repairs shall be in accordance with the Standard Details.
- L. All pavement markings shall be restored to new conditions per the requirements of the governmental agency having jurisdiction.

3.06 HOT-MIX SURFACING FOR ASPHALTIC PAVING

- A. Plant Mixing and Transporting: Mixing, transportation, and temperature limitations for hot-mix surface course materials shall be in accordance with the requirements of Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction.
- B. Placing, compacting, and acceptance shall be in accordance with Division 400, Asphalt Pavements of the AHTD Standard Specifications for Highway Construction.
- C. Surface shall be uniform and shall match adjacent surfaces.

3.07 TEMPORARY SURFACING

- A. Comply with the requirements stated above or as otherwise approved to adequately maintain traffic and proper drainage.
- B. The surface shall match the surfaces on each side of the trench and shall be in accordance with applicable state, county, or local requirements.
- C. The Contractor shall maintain all temporary surfaces in good condition until permanent repairs are complete.

3.08 TRAFFIC CONTROL

- A. Whenever traffic flow restrictions of any kind are anticipated, the Contractor will be required to contact the governmental agency having jurisdiction to be given permission to obstruct traffic flow.
- B. Street closing permits must be obtained from proper government agencies.
- C. Suitable construction signs, barricades, lights, etc. shall be erected and the work outlined by adequate lighting at night in order to protect persons from injury and avoid property damage. Provide qualified flagmen to direct traffic while working upon a highway, street, or road over which traffic must pass.
- D. If requested, Contractor will be required to submit a barricade plan to the governmental agency or traffic control agency having jurisdiction. Barricade plan shall be satisfactory to the traffic control agency having jurisdiction.

- E. Maintain traffic and protect the public from all damage to persons and property in accordance with applicable State, City, and County regulations. Maintain and protect access, for vehicle and pedestrian traffic, to and from all properties adjoining or adjacent to those streets affected by operations, and to subject the public to a minimum of delay and inconvenience.
- F. Traffic shall be detoured as required; however, no traffic shall be detoured without prior knowledge and approval of the traffic control agency having jurisdiction. Notify the traffic control agency having jurisdiction at least 24 hours in advance of the time proposed to detour traffic. No street shall be completely blocked, nor blocked more than one-half at any time without specific authorization.
- G. Closing streets with one access route shall not be acceptable or permitted. One traffic lane shall remain open at any given time. Excavated areas within the traffic lanes of highways, streets, roads and pedestrian walkways shall be backfilled as soon as possible and the area opened to traffic.

END OF SECTION 32 12 16.43

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Providing Portland cement concrete for the following where applicable:
 - 1. Parking and Drives
 - 2. Sidewalks and Steps
 - 3. Curbs and Gutters

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 REFERENCES

- A. American Concrete Institute, 22400 W. Seven Mile Road, Detroit, Michigan 48219.
 - 1. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- B. American Society for Testing and Materials, 1961 Race Street, Philadelphia, Pennsylvania 19103.
 - 1. ASTM C94 - Specification for Ready-Mixed Concrete.
 - 2. ASTM C 150 - Specification for Portland Cement.
 - 3. ASTM C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 4. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 5. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12 in. Drop.
 - 6. ASTM D994 - Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
 - 7. ASTM C-1018 Standard Test Method for Flexural Toughness and First Strength of Fiber Reinforced Concrete (Using Beam with Third Point Loading).
 - 8. ASTM D 1751 - Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruded and Resilient Bituminous Types).

1.05 INSPECTION AND TESTING

- A. Inspection and testing of concrete shall be performed by a firm appointed by Owner and paid for by Contractor.
- B. Three concrete test cylinders will be taken for every 75 or less cubic yards placed each day. One additional test cylinder will be taken during cold weather concreting, and be cured on job site under same conditions as concrete it represents. One slump test shall be taken for each set of test cylinders taken.

PART 2 - PRODUCTS

2.01 MATERIALS AT PARKING AND DRIVES

- A. Subgrade: In accordance with Section 31 00 10.
- B. Base Course: 4 inches of crushed stone uniformly graded from 1/4" to 1-1/4".
- C. Concrete Materials
 - 1. Portland Cement: ASTM C 150; Normal-Type I. Concrete shall have **minimum 4000 psi @ drives** minimum compressive strength at 28 days with maximum slump of 3 inches and 4 to 6 percent air entrainment. 5 inch thickness required.
 - 2. Fine and Coarse Aggregates: ASTM C 33.
 - 3. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.
 - 4. No fly ash will be allowed.
 - 5. Use accelerating admixtures in cold weather only when approved by Architect. Use of admixtures shall not relax cold weather placement requirements. Do not use calcium chloride.
 - 6. Use set-retarding admixtures during hot weather only when approved by Architect.
 - 7. Air Entrainment: Comply with AFPC V2 Tables 1603A and 1603C.
- D. Reinforcement:
 - 1. Wire Fabric: "Specifications for Wire Fabric for Concrete Reinforcement", ASTM A-185.
 - 2. Bars for Reinforcement: "Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A-615, grade 60 unless otherwise shown.
- E. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete.

2.02 MATERIALS AT SIDEWALKS AND CURB AND GUTTER

- A. Curb and Gutter Forms:
 - 1. 2-inch dressed dimension lumber or metal of equal strength, free from defects that would impair appearance or structural quality of completed curb, subject to approval of Architect.
 - 2. Short Radius Forms: 1-inch dressed lumber or plywood.
 - 3. Curb Face: No horizontal joints in form material closer than 7 inches from top of curb.
 - 4. Stakes and Bracing Materials: Provide as required to hold forms securely in place.
- B. Sidewalk Forms:
 - 1. 2-inch dressed lumber, straight and free from defects, or standard metal forms.
 - 2. Short Radius Forms: 1-inch dressed lumber or plywood.
 - 3. Stakes and Bracing Materials: Provide as required to hold forms securely in place.
- C. Concrete Materials:
 - 1. Ready mixed conforming to ASTM C94, Alternate 2.
 - 2. Compressive Strength: 3,500 psi at 28 days.
 - 3. Maximum Size of Aggregate: 1-1/2 inch.
 - 4. Slump: 2 to 4 inches.
 - 5. Air Entrainment: Comply with AFPC V2 Tables 1603A and 1603C.
- D. Reinforcement:
 - 1. Wire Fabric: "Specifications for Wire Fabric for Concrete Reinforcement", ASTM A-185.

2.03 CURING COMPOUND

- A. Liquid membrane forming, clear or translucent, suitable for spray application. Conform to ASTM C 309, Type 1. Safe-Cure™ 800 by ChemMasters, Inc. or approved equal.

2.04 JOINT SEALANT

- A. ASTM C920. Non-priming, pourable, self-leveling polyurethane. Subject to compliance with project requirements manufacturers offering joint sealants which may be incorporated in the Work include, but are not limited to the following:
 - 1. Sonolastic Paving Joint Sealant, by Sonneborn.
 - 2. Sonomeric CT 1 Sealant, by Sonneborn.
 - 3. Sonomeric CT 2 Sealant, by Sonneborn.
 - 4. Vulkem 45, by Mameco.
 - 5. "THC-900" - Tremco, Cleveland, OH (216) 292-5000.

2.05 EXPANSION JOINT FILLER

- A. Minimum 1/2-inch thick asphaltic impregnated fiberboard conforming to ASTM D 1751.
 - 1. "Flexcell" - Celotex Corp., Tampa, FL (813) 871-4811.
 - 2. "Seal Tight Fiber Expansion Joint" - W.R. Meadows, Inc., Elgin, IL 93120 742-4501.

2.06 CONSTRUCTION JOINT MATERIALS

- A. Provide a full slab depth 24 gauge metal pre-shaped key, approximate depth of key to be 1/4 slab thickness and a key width of about 1/10 slab thickness.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

- A. Subgrade for concrete paving improvements shall have all organic silty and clayey topsoils and other unsuitable material removed and replaced with approved material. Fill and tamp traces of utility trenches. Scarify and re-compact subgrade in accordance with Section 31 00 10; proof roll with dump truck. Replace soft spots as needed.

3.02 PARKING AND DRIVES CONSTRUCTION

- A. Place drainage course material on prepared subgrade. Spread course(s) and compact the same day the material is hauled. The material shall be thoroughly mixed, either by repeated handling with a blade grader or by harrowing sufficiently to secure a uniform mixture of coarse and fine particles. Compact drainage course by systematically rolling and watering using three passes with a vibratory steel wheel roller set on medium frequency.
- B. Forming:
 - 1. Form vertical surfaces to full depth and securely position to required line and levels. Ensure form ties are not placed so as to pass through concrete.
 - 2. Arrange and assemble form-work to permit easy dismantling and stripping, and to prevent damage to concrete during form-work removal.
 - 3. Place keyed construction joints as required.
 - 4. Place contraction joints as shown and not exceeding 15 feet on center. Depth to equal 1/4 of thickness of paving.
 - 5. Place expansion joints as shown and not exceeding 60 feet on center. Apply joint sealant specified.
 - 6. Fit longitudinal and cross joints with filler of required profiles. Recess joint filler 1/4-inch below finished concrete surface to allow for placement of sealant.

- C. Placing Concrete:
1. Place concrete continuously between predetermined construction joints.
 2. Screed and wood float surfaces to uniform finish, free to open texturing and exposed aggregate.
 3. Avoid working mortar to surface.
 4. Round edges, including edges of expansion and construction joints, with 1/4-inch radius edging tool.
- D. Finishing:
1. Finish exposed concrete paved vehicular surfaces with wood float finish except where light broom finish is specified. Ensure finished surfaces do not vary from true lines, levels, or grade, by more than 1/4-inch in 10 feet in any direction when measured with straight edge.
 2. Install specified joint sealant in accordance with manufacturer's instructions. Joints that exceed 1/4" per foot slope must be primed in accordance with manufacturers recommendations.
 3. **DO NOT ALLOW ANY TRAFFIC OR LOADS OF ANY KIND ON CONCRETE FOR A PERIOD OF 14 DAYS MINIMUM. DO NOT ALLOW ANY HEAVY TRUCKS OR MACHINERY ON CONCRETE FOR A PERIOD OF 28 DAYS. MINIMUM.**

3.03 CURB CONSTRUCTION

- A. Construct curbs to line and grade shown or established by the Architect and conform to the details shown.
- B. Place, process, finish and cure concrete in conformance with this section and the applicable requirements of ACI 614. Wherever requirements differ, the more stringent shall govern.
- C. Asphalt Impregnated Expansion Joints:
1. At intervals of not more than 60 feet.
 2. Beginning and end of curved portions of the curb.
 3. Connections to existing curbs.
 4. Apply joint sealant specified.
- D. Contraction Joints:
1. Place at intervals not exceeding 10 feet.
 2. Open type joint.
 3. Provide by inserting thin, oiled steel sheet vertically in fresh concrete to force coarse aggregate away from joint.
 4. Steel sheet shall be inserted the full depth of the curb.
 5. After initial set has occurred in the concrete and prior to removing the front curb form, steel sheet shall be removed with a sawing motion.

- E. As soon as concrete has set sufficiently to support its own weight, remove the front form and finish all exposed surfaces.
 - 1. Finish top of curb with a steel trowel.
 - 2. Finish edges with a steel edging tool.
 - 3. Rub formed faces with burlap sack or similar device to produce a uniformly textured surface, free from form marks, honeycomb and other defects.
- F. Backfilling Curb: Upon completion of curing period, but not before 7 days has elapsed since pouring the concrete, backfill the curb.
- G. Adjusting:
 - 1. Finished curb shall present a uniform appearance for both grade and alignment.
 - 2. Remove curb sections showing abrupt changes in alignment or grade or which are more than 1/4 inch away from location as staked or which are defective for any reason.
 - 3. Construct new curb at Contractor's expense.

3.04 SIDEWALK CONSTRUCTION

- A. Thickness of sidewalks shall be as shown on the drawings.
- B. Place, process, finish and cure concrete in conformance with this section and the applicable requirements of ACI 614. Where the requirements differ, the more stringent shall govern.
- C. Preformed Asphalt Expansion Joints.
 - 1. At maximum intervals of 60 feet.
 - 2. Where sidewalk ends.
 - 3. Around posts, poles or other objects protruding through the sidewalk.
 - 4. Apply joint sealant specified.
- D. Contraction Joints:
 - 1. Spacing to match width of sidewalk up to 6 feet wide. For walks over 6 feet wide maximum spacing not to exceed 5 feet.
 - 2. Provide transversely to the walks.
 - 3. Depth to equal 1/4 of thickness of walk.
 - 4. Tool joints into fresh placed concrete. DO NOT SAW CUT JOINTS.
- E. Finish:
 - 1. Broom finish with fine hair broom at right angles to length of walk and tool at all edges, joints and markings.
 - 2. Mark walks transversely at intervals shown on drawings with a jointing tool.

END OF SECTION 32 13 13

PART 1 - GENERAL

1.01 SUMMARY

- A. Paint parking lot lines, letters, directional arrows, island curbs, etc. as shown on the drawings.

1.02 RELATED DOCUMENTS

- A. Applicable portions of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda issued prior to the execution of the Contract, other documents listed in the Agreement and Modifications issued after the execution of the Contract shall apply to this Section. The general requirements for this work are located in Division 1 of the Specifications.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. In accordance with Section 01 33 00.
 - 1. Paint System Data Sheet (PSDS) from paint manufacturer for each system used.
 - 2. Technical Data Sheets for each product used in the paint system.
- B. Substitutions will not be considered prior to the award of the General Contract.

1.04 QUALITY ASSURANCE

- A. Inspection by Architect, or waiver of inspection of any particular portion of the work, shall not be construed to relieve Contractor of his responsibility to perform the work in accordance with these specifications.

1.05 WARRANTY

- A. Contractor shall warrant to Owner and guarantee work under this section against defective workmanship and materials for a period of 1 year commencing on the date of final acceptance of the work.

PART 2 - MATERIALS

2.01 TRAFFIC AND ZONE MARKING PAINT

- A. Provide Fast Dry Latex Supreme meeting Federal Specification TT-P-1952F, Type I and II as manufactured by RAE Products & Chemicals Corporation, 1-877-275-7550, www.RaePaint.com ,or approved equal offering the following colors:
 - 1. White 9510

2. Yellow 9511
3. Blue 4834
4. Red 5408
5. Black 8512
6. Green 5708

PART 3 - EXECUTION

3.01 GENERAL

- A. Paint shall be applied in 2 coats to a clean dry surface using template or a stripping machine. Stripes shall be a uniform width of 4 inches wide. Other markings shall be as shown on drawings.

END OF SECTION 32 17 23