

PROPOSAL FORM
BALTIMORE COUNTY
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
TOWSON, MARYLAND

Division of Construction Contracts Administration

DESIGNER / PROJECT MANAGER

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Contract Number 25053 PO0
Property Management Project
Glen Arm Maintenance Facility Sign & Signal HVAC Replacement –
12200 Long Green Pike, Glen Arm, Maryland 21057
Glen Arm – District 11c3
Workday Number
PROJ-10000969

CONTRACT BASED ON SEPTEMBER 2023
STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS
AND STANDARD DETAILS FOR CONSTRUCTION

Bidders Information

A pre-bid meeting will be held on Wednesday May 7, 2025 at 10:00 a.m. EST via WebEx. *Phone-In* (Audio Only) 1-415-655-0001, Meeting Number 2315 748 1904##. *Video Conference* go to <https://signin.webex.com/join> Meeting Number 2315 748 1904, **Password:** **YmQBwHea327**, for Webex link go to: www.baltimorecountymd.gov/departments/public-works/engineering/contracts/current-solicitations

Baltimore County Prevailing Wage and Local Hiring Affidavit, Wage Rates & Requirements **see pages 340-347**

(Contract Disclosure): *“Wage rates that are in effect as of the contract solicitation date will be the wage rates through the duration of the project”*

MBE/WBE Requirements & Forms **see pages 348-362**

THIS PROPOSAL FORM INCLUDES AND INCORPORATES ALL DOCUMENTS AND INFORMATION REFLECTED, LISTED, AND/OR REFERENCED IN THIS TABLE OF CONTENTS, AND ALL SUCH DOCUMENTS AND INFORMATION ARE PART OF AND INCORPORATED INTO THE CONTRACT DOCUMENTS.

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SECTION I

INFORMATION FOR BIDDERS

ELECTRONIC SUBMITTAL PROCESS

To be considered, Bids (Section IV – Proposal) shall be received by the bid closing date and time to the following email address dpwbid@baltimorecountymd.gov. The contract number and company name should be referenced in the Subject Line of the email. Bids may not be submitted by any other means. Bids that are mailed or otherwise delivered to the Purchasing Division (including emails which indicate links to locations where the bid may be downloaded) and/or emails sent to any other Baltimore County email address will not be accepted.

Late Bids will not be considered. Bidders are strongly encouraged not to wait until the last minute to submit bids. The time stated on the auto-receipt (described below) will be definitive of the time of receipt. Bids received after the deadline will not be accepted. Bidders are advised that the County cannot receive email attachments greater in size than twenty-five (25) megabytes and this size limitation may be further reduced by requirements of the Bidder's email provider which are beyond the control of the County. Bidder should consider separating any large bid attachment into multiple parts and emailing each part separately. In such case, Bidder will note that each email is *1 of 2, 2 of 2*, etc. Multiple part bids will not be considered unless all parts are received by the bid closing date and time.

After submitting a Bid to dpwbid@baltimorecountymd.gov, and upon successful receipt by the County thereof, Bidder will receive an auto-receipt email. This receipt is proof that the bid has been received by the Division of Construction Contracts Administration and should be retained for Bidder's records. In the case of a bid submitted in multiple parts as described above, an auto-receipt email will be generated for each part. The County has no obligation to consider any Bid for which an auto-receipt was not generated.

As with any system, power outages or technology problems may arise that are outside of the County's control and could affect your submission. The County will not be held accountable for such issues that may delay the transmission of any Bid.

NOTE: Electronic copy of the Bid Bond will be accepted at bid opening. The apparent low bidder is required to submit the original Bid Bond within ten (10) days after the bid opening to the Division of Construction Contracts Administration, 111 West Chesapeake Avenue, Room 300B, Towson, Maryland 21204.

INSTRUCTIONS AND SPECIFICATIONS

Refer to the enclosed proposal sheets for quantities to be bid upon. All proposals submitted on the attached form must give the price in clear figures for each item of the proposed work and be signed by the bidder with his name and address. Bidders must not change any item in the proposal for which a price has been stipulated by the County. Any change will cause rejection of the proposal.

NOTE: STATEMENT UNDER OATH FORM TO ACCOMPANY BID as per Baltimore County Purchasing Act 65-98, Section 15-94 and 15-95 which requires that the enclosed affidavit (see Proposal Affidavit pages in Section IV) be completed and submitted as part of the sealed bid.

Proposals made on any other than the attached form will not be considered. All papers included in, bound thereto, or attached to the Proposal Form are necessary parts thereof and shall not be detached, separated, or altered in their intent.

Changes in the phraseology of the proposal, additions, or limiting provisions will render the proposal informal or void and may cause its rejection.

All right is hereby reserved by the Purchasing Agent to reject any or all proposals and to waive formalities and technicalities as the interest of the County may require.

No successful bidder may withdraw his bid within NINETY (90) days after the opening thereof.

The successful bidder will be required to be bonded to Baltimore County, Maryland to the sum of One Hundred per Cent (100%) of the amount of his proposal or proposals according to the form of bond hereto attached for projects in excess of \$25,000.00.

This Proposal must be accompanied by a Bid Bond in an amount of 5% of the bid, the exact amount to be determined by the difference between the low bid and the next lowest bid if two or more bids are received, or 5% of the bid if one bid is received. This guarantees payment of the amount thus determined in case of a default in any matter specified as required before award or in any matter resulting in failure to execute and deliver an Agreement, together with Payment and Performance Bonds, after award. The Bid Bond must be in the form accompanying the Proposal executed by a Surety licensed in the State of Maryland. The Surety must be currently rated "B" or better by the A. M. Best Company, and the bid must be in an amount less than, or equal to, the underwriting limitation contained in Department of Treasury Circular 570 as amended at the time of the underwriting.

All work to be performed under this contract shall be done under strict compliance with Baltimore County Department of Public Works and Transportation September 2023 Standard Specifications for Construction and Materials and Standard Details for Construction and any and all proposed revisions thereto as of the date of advertisement and copies of which are available on the County's website at www.baltimorecountymd.gov/departments/public-works/standards, and all of which are made a part hereof and incorporated herein (collectively, the "Specifications").

If the bidder to whom an award is made shall fail to execute the contract and bond hereto attached and as herein provided, the award may be annulled and the contract awarded to the lowest responsible bidder who has consented to a time extension, and such bidder shall fulfill every stipulation embraced herein as if he were the original party to whom the award was made, or the Purchasing Agent may reject all of the bids as the interest of the County may require.

The Bid Bond of the three lowest bidders is deemed to be effective until the execution and delivery of the Contract Agreement, together with Payment and Performance Bonds for projects in excess of \$25,000.00 or until rejection of all bids, whereupon Surety is deemed relieved of all further obligations under the bid bonds provided.

Bidders must examine the drawings and specifications carefully and must make a personal examination of the location and nature of the proposed work. In case doubt shall arise as to the meaning or intent of anything shown on the drawings or comprised in the specification, inquiry shall be made of the Director of Public Works and Transportation at least five (5) days prior to the date of

bid opening. The submission of the Proposal shall indicate that the bidder thoroughly understands the drawings and the terms of the Specifications.

To better ensure fair competition and to permit a determination of the lowest bidder, unresponsive bids or bids obviously unbalanced may be rejected by the Purchasing Agent.

Bidders are required to fill out the total price column and total their proposals so that the result of the bidding, barring possible arithmetical errors, will be known at once. Any errors in computations will be corrected by the Engineer when the proposals are canvassed. Where the unit price and the total price are at variance, the unit price will prevail.

Bidders must be prepared to complete the work within the time stated in the proposal.

NOTE: ONLY CONTRACTORS FORMALLY PRE-QUALIFIED WITHIN THE ADVERTISED WORK CLASSIFICATION BY THE DIRECTOR OF PUBLIC WORKS AND TRANSPORTATION OF BALTIMORE COUNTY 10 CALENDAR DAYS PRIOR TO BID OPENING WILL BE ELIGIBLE TO SUBMIT BIDS.

Contracts for work under this proposal will obligate the contractors and subcontractors not to discriminate in employment practices. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the contract. Successful bidders must be prepared to comply in all respects with the Contract Provisions regarding nondiscrimination.

Baltimore County has adopted a Minority Business Enterprise (MBE) program and Women's Business Enterprise (WBE) Program. The percentage of participation applies to the contract amount awarded to the Contractor. Qualified minority subcontractors are those certified as being a Minority Business Enterprise by the following:

1. Maryland Department of Transportation Certification Committee (MDOT)
2. City of Baltimore, Minority Business Certification Council

Projects funded by the Federal Highway Administration are limited to the certification listed under #1 (MDOT).

More detailed information regarding the County's MBE/WBE Program can be obtained from the County MBE Office, telephone (410) 887-3407. See Executive Order dated December 6, 2022. MBE/WBE Participation Summary and Forms A, B, C, D and E enclosed in this proposal booklet.

NOTE: If you do not complete and submit the enclosed forms with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer **NON-RESPONSIVE** and accordingly the **COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.**

The County reserves the right to require the low bidder to produce evidence indicating that the company's financial condition is equal to, or better than, that enjoyed by the company at the time of prequalification. This additional information may be in the form of a financial statement or other evidence satisfactory to the Office of Budget and Finance.

Bidders' attention is directed to the requirement that a permit must be obtained from the Baltimore County Bureau of Highways and Bureau of Traffic Engineering prior to cutting any County

road for the purpose of obtaining sub-surface soils information, and permission must be obtained from the State Highways Administration prior to making any openings in a State road.

Under no circumstances shall a bidder enter upon any property outside a County or State road for the purpose of securing sub-surface soils information until permission is received from the property owner. The fact that the County has obtained a utility easement does not give the bidder the right to enter upon the property.

Prevailing index price of asphalt cement/ton \$640.00.

INCLEMENT WEATHER POLICY: If Baltimore County General Government Offices are open or open with liberal leave the day the bids are due, the bids are due as stated in the bid documents (date and time). **ONLY** when the Baltimore County General Government Offices are **OFFICIALLY CLOSED** the day the bids are due, the bid date will be postponed and an Addendum will be issued the next business (or next day buildings are officially open) day the county offices are open with the new bid date and time.

BID TABULATIONS: All bid tabulations will be confidential until after final award, at which time the total bid amounts for all bidders, as well as the complete bid tabulations for the top three (3) bidders, can be inspected by others when requested in writing pursuant to the Maryland Public Information Act.

ALTERNATIVE SOURCES OF CONTRACT BONDS: In the event your company is unable to qualify for bonding through a traditional commercial surety company, you may qualify for the required bonds through the State of Maryland, Department of Commerce (DOC). The **Maryland Small Business Development Financing Authority (MSBDFA, pronounced Mis-Bid-Fa)**, an agency of DOC, operates a Surety Bond Program designed to assist small businesses, based in Maryland, that are unable to obtain adequate bonding on reasonable terms in the commercial marketplace. MSBDFA provides bid, payment and performance bonds for contracts funded by government agencies, regulated utilities and private entities. The penal sums of the bonds are limited to the aggregate amount of \$2,500,000 and companies may pre-qualify for multiple bonds within pre-approved terms and conditions. MSBDFA also provides lines of credit, term loans and loan guarantees to help qualified businesses purchase equipment and real property, make improvements to leased property, refinance existing debt and assist them with their working capital needs. For more information on how to apply, you may contact: Meridian Management Group, Inc. (MMG), (the Program's Manager), 826 E. Baltimore Street, Baltimore, Maryland 21202, Telephone: (410) 333-4270. Or visit their website at www.mmcapitalgroup.com for information, applications and a checklist of required documents and reports that must accompany the application.

S E C T I O N I I

SPECIAL PROVISIONS

MAINTENANCE BOND

Per the Baltimore County Department of Public Works and Transportation September 2023 Standard Specifications for Construction and Materials, Section GP – 4.10 (C) states, the contractor is required to post a maintenance bond in the amount of five (5) percent of the total cost of the contract or withhold five (5) percent retainage for two (2) years from the date of Final Acceptance.

BALTIMORE COUNTY, MARYLAND

BOND NO. _____

CONTRACT NO. _____

MAINTENANCE BOND

THIS MAINTENANCE BOND is entered into on this _____ day of _____, 20____, by and between _____, as principal ("Principal") and _____, a business entity that is authorized to transact business in the State of Maryland and is organized and existing under the laws of the State of _____, as surety ("Surety"), are held and firmly bound unto Baltimore County, Maryland, a body corporate and politic of the State of Maryland ("County"), as Obligee.

WHEREAS, the above-named Principal has entered into a written contract known as Contract Number _____ dated _____, 20____ with Obligee for _____ (the "Agreement"), the terms of which are hereby incorporated by reference; and

WHEREAS, Principal has completed construction under the Agreement; and

WHEREAS, the Agreement includes a warranty on the quality of the Work performed that runs for a period of two (2) years from the date of the County's final acceptance and that runs for two (2) additional years beyond the repair date if any repair is done during the warranty period; and

WHEREAS, Principal is required to cause this instrument to be executed and delivered to Obligee as security for maintenance during the warranty period in an amount equal to 5% of the total value of the Contract.

NOW, THEREFORE, the Principal and Surety are held and firmly bound unto the Obligee in the sum of \$ _____ Dollars (\$ _____), lawful money of the United States of America, for the payment of which sum of money the Principal and Surety do bind themselves and their personal representatives, legal representatives, successors, and assigns, jointly and severally, firmly by this maintenance bond.

The conditions of this bond are as follows:

1. The Principal shall, for a period of two (2) years from and after the date of completion and acceptance of same by Obligee, replace all defects arising in the Work, whether resulting from defective materials, equipment, design furnished or workmanship. After such period, this obligation shall be null and void; otherwise it shall remain in full force and effect.

2. In the event of a default on the part of the Principal that may be the subject of a claim under this bond, Obligee shall mail, by certified mail, to Surety at the address listed below, a written statement that a claim is being made under the bond and, with substantial accuracy, the amount of the claim. Surety shall have no obligation to Obligee under this bond until the notice of claim is mailed.
3. When the Obligee has satisfied the condition of Paragraph 2 that a notice of claim be mailed, the Surety shall promptly and at the Surety's expense send an answer to Obligee within 30 days after the date of the claim. The answer shall state the amounts that are undisputed and the basis for challenging any amounts that are disputed. The answer shall be accompanied by payment (or arrangements for immediate payment) of any undisputed amounts.
4. Surety expressly waives any right to receive notice of extensions of time or alterations or modifications to the Agreement that may be granted by Obligee and agreed upon by Principal, and any such extensions, alterations, or modifications shall not affect the obligation of the Surety under this bond.
5. This bond is a specialty governed by the twelve-year statute of limitations period set forth in the Annotated Code of Maryland Courts and Judicial Proceedings §5-102.

WITNESS OR ATTEST:

(Principal – Contractor Name)

By: _____

Type Name: _____

Type Title: _____

Date: _____

(Surety)

By: _____

Type Name: _____

Type Title: _____

Type Address: _____

Date: _____

The Contract shall be done in strict compliance with the Baltimore County Department of Public Works and Transportation September 2023 "Standard Specifications for Construction and Materials" and "Standard Details for Construction", and any and all revisions thereto as of the date of the fully executed Contract, including but not limited to the General Conditions Building Projects, as applicable, and all of which are made a part hereof and incorporated herein (collectively, the "**Specifications**"). Copies of which are available on the County's website at www.baltimorecountymd.gov/departments/public-works/standards. **IN ADDITION, THE CONTRACTOR UNDERSTANDS AND AGREES THAT THE FOLLOWING SECTIONS OF THE SPECIFICATIONS (GP-1.03 AND GP-5-15) SHALL BE STRICKEN AND THE FOLLOWING SHALL BE INSERTED IN AND INCORPORATED INTO THE CONTRACT IN LIEU THEREOF:**

GP-1.03 ORGANIZATIONAL DEFINITIONS

Administration - Baltimore County.

Administrator - The Director of the Office of Budget and Finance, Baltimore County.

Baltimore County - Baltimore County, Maryland: a body corporate and politic.

Department - The word "Department" shall mean the Office of Budget and Finance of Baltimore County.

Engineer - One of the following engineering executives:

Director of Office of Budget and Finance
Chief, Property Management Division of the Office of Budget and Finance

Any delegation of the Engineer's authority must be authorized in writing by any one of the above listed officials, and such delegation of authority will pertain only to the specific contract and/or contracts shown by the authorization. The title of the specific official will appear in those cases within these specifications where the word "Engineer" as defined herein is not sufficiently specific.

Inspector - The authorized representative of the procurement officer assigned to make detailed inspection of any or all portions of the work, or materials therefor.

Procurement Officer - See Engineer.

GP-5.15 DISPUTES

(a) Except as otherwise may be provided by applicable law or regulation, all disputes arising under or as a result of a breach of this Contract that are not disposed of by mutual agreement shall be resolved in accordance with this General Provision.

(b) As used herein, "claim" means a: written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of Contract terms, or other relief, arising under or relating to this Contract.

A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this General Provision. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed either as to liability or amount, it may be converted to a claim for the purpose of this General Provision.

- (c) When a claim cannot be resolved by mutual agreement, the Contractor shall submit a written request for decision to the Department's Chief of the Property Management Division for his decision in consultation with the County Office of Law. The Contractor's written request shall set forth all the facts surrounding the controversy, including, but not limited to, those items listed in GP-5.14(b). Any claim by the County shall be decided in like manner.
- (d) The Contractor, at the discretion of the Engineer, may be afforded an opportunity to be heard and to offer evidence in support of his claim. Pending resolution of a claim, the Contractor shall proceed diligently with the performance of the Contract.
- (e) The Department's Chief of the Property Management Division shall decide any and all claims. The decision by the Department's Chief of the Property Management Division shall be issued within ninety (90) Days on matters of less than fifty thousand dollars (\$50,000) and within one hundred eighty (180) Days on matters of fifty thousand dollars (\$50,000) or more. The written decision of the Department's Chief of the Property Management Division shall be final and binding unless appealed in writing to the Director of the Department within thirty (30) Days of the Chiefs written opinion to the parties. If the Chiefs decision is timely appealed in writing to the Director of the Department, the Director of the Department, serving as referee, will review the written appeal submitted to assure all reasonable attempts were made to resolve the appeal.
- (f) The Director shall issue his/her decision in writing within ninety (90) Days. The Director's decision shall be final and conclusive unless a written appeal is mailed or otherwise filed with the County Administrative Officer within thirty (30) Days of the Director's written decision.
- (g) When the County Administrative Officer is satisfied all efforts at the Department level were made to resolve the dispute, a claim shall be resolved as follows:

 - (1) Subject to, and without in any way enlarging or limiting the other provisions of the Contract, the parties to any Agreement which adopts or incorporates by reference these Standard Specifications, appoint the County Administrative Officer as an administrative hearing officer pursuant to Article 25A, "Chartered Counties of Maryland", of the Annotated Code of Maryland.
 - (2) The parties further grant the County Administrative Officer the right to delegate this responsibility and authority in writing to a County official who is a registered professional engineer, independent of the Department of Public Works and Transportation's Division of Construction Contracts Administration, or to any other County official.
 - (3) For disputes involving ten thousand dollars (\$10,000) or more the decision of the administrative hearing officer shall be final and binding on both parties, subject only to such appeals on the record as provided by Article 25A. For disputes involving less than ten thousand dollars (\$10,000), the decision of the administrative hearing officer shall be final and binding on both parties.

GENERAL CONDITIONS

BUILDING PROJECTS



**Revised September 1, 2024,
in compliance with September 2023
Standard Specifications for Construction and Materials**

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BUILDING PROJECTS**

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GENERAL CONDITIONS DESIGN BUILD BUILDING PROJECTS

I. SPECIFICATIONS

Article 1 Applicable Specifications

All work performed under this Contract shall be done under strict compliance with the *Specifications* bound herewith, and with the *Baltimore County Standard Specifications for Construction and Materials* and the *Standard Details for Construction* dated September 2023 and subsequent addenda thereto, so far as the same may be applicable, copies of which are available on the County's website at www.baltimorecountymd.gov/departments/public-works/standards. These General Conditions are in addition to the aforementioned Specifications. Should there be any conflict with the aforementioned manuals, the *General Conditions* take preference.

II. DEFINITIONS

Article 2 Definitions

- A. *Architect and/or Engineer* shall mean the registered Architect and/or Engineer commissioned by the County to prepare the plans and contract documents.
- B. *Engineer* in these General Conditions and in the Construction Specifications in some instances refers to authorized representatives of the Office of Budget and Finance, Property Management.
- C. *Subcontractor*, as employed herein, includes only those having a direct contract with the Contractor. It includes one who furnished material worked to a special design according to the Plans and Specifications for the "work." It excludes one who merely furnished material not so worked.
- D. *Written Notice* shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered to or sent by registered mail to the last business address known to him who gives the notice.
- E. *Repair* means to restore after injury, deterioration, or wear; to mend, to renovate, by such means as appropriate, and to supply such materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth, and fully serviceable. Upon completion of such repair it must be, unless otherwise stated, rendered to such condition as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish, to be applied without extra cost to the County. When the word "repair" is used in connection with machinery or mechanical equipment, it shall mean, in addition to the above, rendering the equipment completely serviceable and efficient, ready for the normal use for which it was originally intended.

- F. Some parts of the "Construction Specifications," bound herewith are of the abbreviated or "streamlined" type and includes incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "in conformity therewith", "shall be", "as noted on the drawings", "according to the plans", "a", "an", "the", and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings. Words "shall be" or "shall" will be supplied by inference when colon (:) is used within sentences or phrases.

Article 3 Time Limits

The proposal shall indicate whether the contract limit is based on Working Days or Calendar Days. If this is not indicated in the Proposal, then the time limits will be based on Calendar Days.

Article 4 Sunday, Night and Holiday Work

If Sunday, night or holiday work is necessary due to an emergency or is permitted by the Engineer, the Contractor shall secure and pay for any and all permits required in connection with this work.

III. CONTRACT DOCUMENTS AND SHOP DRAWINGS

Article 5 Contract Documents

A. Clarification

It is assumed that the Contractor has obtained clarification of all questions which may have arisen as to intent of the contract documents, or assumed, or actual conflict between two or more items in the Contract Documents as required in "Instructions to Bidders." Should the Contractor have failed to obtain such clarification as required by the "Instructions to Bidders," then the Engineer may direct the work to proceed by any method indicated, specified or required by the Contract Documents in the interest of maintaining the best construction practice. Such direction by the Engineer shall not constitute a claim for extra by the Contractor.

B. Jargon

Work described in words that have a well-known technical or trade meaning shall be held to refer to such recognized standard use.

C. Drawings

The Contractor shall do no work without proper drawings and instructions. Drawings are, in general, drawn to scale; however, symbols are used to indicate materials and structural and mechanical requirements. When symbols are used, the drawings are, of necessity, diagrammatic, as it is not possible to indicate all connections, fittings, fastenings, etc., which are included as a part of the work. Diagrammatic indication of mechanical piping, ducts, and conduit within the buildings is subject to adjustment in order to obtain proper grading, passage over, under or past obstructions, to avoid exposure in finished rooms and unsightly and obstructing conditions. The Contractor shall coordinate these adjustments.

1. Copies no longer Furnished

The County will no longer furnish the Contractor any copies of the Drawings and Specifications. Additional copies may be obtained by the Contractor downloading drawings and specifications from the Baltimore County Solicitation Web Page.

2. Copies of the Work

The Contractor shall keep in the office on the job a complete set of all drawings, specifications, shop drawings, schedules, etc., in good order and available to the Engineer and representatives of the County.

3. Ownership

All documents as furnished by the County remain the property of the County. They must not be used on other work but shall be returned to the County upon completion of the work.

D. Large Scale Detail Drawings

The Architect shall furnish, when necessary, additional instructions in the form of large scale developments of the drawings used for bidding, or to amplify Construction Specifications for the proper execution of the work. These shall be true developments of the bidding documents and reasonably inferable there from. The work shall be executed in conformity herewith. [See Article 6, Paragraph A.3.(c)]

E. Dimensions

The Contractor shall carefully check all dimensions prior to execution of the particular work affected. Whenever inaccuracies or discrepancies are found, the Contractor shall consult the Engineer prior to any construction or demolition. Should any dimensions be missing, the Engineer will be consulted and supply them prior to execution of the work. Dimensions for items to be fitted into constructed conditions at the job will be taken at the job and will be the responsibility of the Contractor. The obvious intent of the documents or obvious requirements dictated by conditions existing or being constructed supersedes dimensions or notes which may be in conflict herewith.

Whenever a stock size manufactured item or piece of equipment is specified by its nominal size, it is the responsibility of the Contractor to determine the actual space requirements for setting or entrance to the setting space. No extra will be allowed by reason of work requiring adjustment in order to accommodate the particular item of equipment.

Whenever new work, building, addition or portions thereof are not accurately located by plan dimensions, the Engineer will supply exact position prior to execution of the work.

Article 6 Shop Drawings

A. Shop Drawings (those prepared by the Contractor or Vendor of Material)

The Contractor shall submit for the Architect's approval, at such times as agreed (see Article 8), shop drawings (to include setting drawings and schedules) as required for the work of the various trades. These drawings shall be prepared in conformity with the best practice and standards for the trade concerned. Due regard shall be given to speed and economy of fabrication and erection.

1. Items to be Detailed

Shop details shall be supplied for all items which are specially fabricated for the work or when the assembly of several items is required of a working unit. Shop drawings are required for all reinforcing and structural steel, specially made or cut masonry units, miscellaneous metal work, specially made flashings or roofing and sheet metal work, specially made millwork, special rough hardware and all heating, ventilating, plumbing and electrical requiring special fabrication or detailed connections, including ducts.

2. Submissions

Shop drawings, brochures and catalog cut submissions shall consist of sufficient copies to provide for the retention by the Architect and County of five (5) copies total plus such additional copies as the Contractor may require. Drawings shall not exceed 24 in. x 36 in. in size.

3. Examination and Approval

The Contractor shall review all shop drawings, brochures and catalog cuts provided by the subcontractors and vendors prior to submitting them to the Architect. The Architect shall examine shop drawings with reasonable promptness, noting desired corrections, or granting approval.

a. Field Dimensions and Conditions

The Architect is not responsible for the checking of dimensions or existing conditions in the field. This is the sole responsibility of the Contractor.

b. Resubmission

When the Architect's notations or corrections are extensive, then the Contractor shall resubmit the drawings with changes made on the drawings.

c. Contractor's Responsibility

Unless the Contractor has in writing, notified the Architect to the contrary, at the time of submission, it will be assumed that the drawings are in conformity with the Contract Documents and do not involve any change in the Contract price or any change which will alter the space within the structure or alter the manner of operation from that contemplated in the Contract Documents.

d. Architect's Notations

Should the Contractor consider any change or notation received in compliance with paragraph (c) above as increasing the cost of the work from that contemplated in the Contract Documents, then the Contractor shall desist from further action relative to the item he/she questions and shall notify the Engineer, in writing, within five (5) days of the additional cost involved. No work shall be executed until the entire matter is cleared or a Change Order issued, or the Contractor is ordered by the Engineer to proceed under the provisions of the County's Standard Specifications. Failure of the Contractor to serve written notice, as above required, shall constitute a waiver of any claim in relation thereto.

(1) Similarly, should the Architect's notation or change involve less work than is covered by the Contract Documents, the Contractor shall allow the County the credit resulting from the change.

(2) Should the Contractor consider that any notation or change made by the Architect under provisions of this paragraph, paragraph (c), above, as involving a complete change in the subcontractor's relation or the substitution of a material different from that on which the Contract was based, then the Contractor shall act as herein stated or as in paragraph (c) above.

4. Project Completion

At the completion of the project, the Contractor shall submit a list of shop drawings for the entire project. This list shall contain the following information: title, description, specialty (Architectural, Structural, Mechanical, etc.), decision (no exceptions taken, approved, approved as noted, etc.).

Article 7 Separate Contracts

A. The County reserves the right to let other contracts in connection with paving and utilities adjoining this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.

- B. If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. Failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the work, except as to the defects which may develop in the other contractor's work after the execution of the work.
- C. To ensure the proper execution of his/her subsequent work, the Contractor shall verify work already in place and shall at once report to the Engineer any discrepancy between the executed work and the drawings.

IV. PAYMENTS

Article 8 Payments

- A. Under this Contract payments will be made monthly on the valuation of work accomplished and on account of materials delivered on the site, for incorporation in the work, which are suitably stored.
- B. At the first of each month, the Contractor shall submit to the Engineer an application for payment on a form provided by the Engineer. Prior to application for first payment, the Contractor shall submit to the Engineer a schedule of values for the various parts of the work, including quantities, aggregating to the total sum of the Contract. This shall be so divided as to facilitate payment to subcontractors in accordance with Article 28, Paragraph C.1. The form of this submission shall be such as the Contractor or Engineer have agreed upon, and, if required, shall be supported by such evidence as to its correctness as the engineer may direct. This schedule, when approved by the Engineer, shall be used as a basis for approval of payment unless it is found to be in error. In applying for payment, the Contractor shall submit a statement based upon the schedule, itemized in such form and supported by such evidence as the Engineer may require, showing the Contractor's right to the payment claimed. If required, the Contractor shall show receipts and other vouchers for the payments for materials and labor including payments to subcontractors, as required by Article 28.
- C. Materials Purchased Under Allowance

The Engineer will provide schedules for all materials to be purchased from specified allowance.

Article 9 Approval of Payments

If the Contractor has made application, as above, the Engineer shall review and approve such payments as is decided to be properly due in accordance with the approved schedule. In approving such partial payments, there shall be retained no more than 10% of the total amount for the first 50% of the contract, after which only 5% of the total amount of the contract may be withheld unless the need is demonstrated for retaining more to protect the public interest.

Article 10 Payment Withheld

- A. The Engineer may withhold, or on account of subsequently discovered evidence, nullify the whole or a part of any payment to such extent as may be necessary to protect the County from loss on account of:
1. Defective work not remedied.
 2. Claims filed, or reasonable evidence indicating probable filing of claims, by parties other than the Contractor.
 3. Failure of the Contractor to make payments properly to subcontractors or for material or labor.
 4. A reasonable doubt that the Contract can be completed for the balance then unpaid.
 5. Damage to another Contractor.
 6. Failure of the Contractor to submit data required within the time limits stated in the Contract Documents.

Upon removal of the above, payment shall be made for the amounts withheld.

Article 11 Changes in Work

- A. The County, without invalidating the Contract, may order changes in the work by altering, adding to or deduction from the work, the Contract sum being adjusted accordingly. Such change shall be executed under these *General Conditions*. Extension of time made necessary thereby shall be adjusted at the time of such Change Order.
- B. The Engineer shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purpose of the project. Otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless a written order for the Office Budget and Finance, Property Management signed or countersigned by the Director has been received by the Contractor. No claim for addition to the Contract sum shall be valid unless so ordered.
- C. The value of any such extra work or change shall be determined in one or more of the following ways as determined by the Office of Budget and Finance, Property Management.
1. By Estimate and Acceptance of a Lump Sum
 - a. The prime Contractor shall furnish a breakdown of the estimated construction cost. The breakdown shall be of sufficient detail to describe the extra work and related costs for labor, material, overhead and profit.

b. Overhead and Profit

(1) Extra work by Subcontractor:

Subcontractor will be allowed 10% overhead and 10% profit added to the direct labor and material costs. The prime contractor will be allowed to increase the subcontractors total lump sum by 10% to cover his/her administration.

(2) Extra work by Prime Contractor:

The prime contractor will be allowed 10% overhead and 10% profit added to the labor and material costs.

- c. The prime contractor will be allowed 1 % for the bond added to the labor and material costs.
- d. The allowed overhead will include all supervision; no additional allowance will be made for it.

2. By Unit Prices Named in the Contract or Subsequently Agreed Upon

Such unit prices are to include all supervision, overhead, taxes, insurance and profit.

3. By Cost and a Fixed Fee

Added to the cost is a fixed fee portion which is to include supervision, overhead, insurance and profit.

4. By Force Account (Labor and Material Cost plus)

In accordance with the *Baltimore County Specifications for Construction and Materials* Section GP 9.02, the Contractor is allowed to add 65% mark-up.

- D. Should none of the methods stated in Paragraph C. 1, 2, or 3 be determined, the Contractor shall, providing he/she receives an order as defined in Paragraph B, above, proceed with the work on the basis of Paragraph C. 4. Force Account.

The Contractor and Engineer shall keep accurate costs, in such form as the Engineer may direct, for presentation, together with vouchers, to the Office of Budget and Finance Property Management for determination of the value of the work included in each Change Order. Pending determination of the final value, the Engineer may include payments for materials and labor, as stated in Article 8, in monthly vouchers.

Article 12 Claims for Extra Cost

No claim for extra will be granted which includes cost of delays or work stoppage due to strikes, lockouts, fire, avoidable casualties or damage or delay in transportation for which the County or its agents are not responsible. (See also Article 14.)

Article 13 Deductions for Uncorrected Work

If the Engineer and County deem it expedient to correct work injured or done not in accordance with the Contract, an equitable deduction from the Contract price shall be made therefore.

Article 14 Delays and Extension of Time

If no schedule or agreement stating the dates upon which drawings shall be furnished is made (see Article 8), then no claim for delay shall be allowed on account of failure to furnish drawings until two (2) weeks after demand for such drawings, and then not unless such claim is reasonable.

Article 15 Correction of Work After Final Payment

Neither the final certificate nor payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty materials and workmanship. Unless otherwise specified, the Contractor shall remedy any defects and pay for any damage to other work resulting there from that appears within the guarantee period. The County shall give notice of observed defects with reasonable promptness. All questions arising under this Article shall be decided by the Director of Budget and Finance, Property Management.

Article 16 (Deleted)

Article 17 Assignment

The Contractor shall not assign the Contract. It shall not be sublet as a whole or sublet by trades or other portions in an amount of more than 75% of the monetary value of the Contract. The remaining 25% shall be executed by the Contractor with labor and materials directly purchased and paid for by the Contractor. Costs for insurance, over-head, supervisions, etc., may not be claimed as a portion of the 25% mentioned above. The execution of work by a subsidiary of the Contractor is not considered direct employment. The Contractor shall not assign any monies due or to become due to him/her hereunder, without the previous written consent of the County.

Article 18 Maryland State Sales Tax

- A. Contractors who are performing work for the State of Maryland or any of its political subdivisions are required to pay tax on materials and supplies which will be incorporated into the work.

- B. The Contractor must pay the tax on all equipment which is purchased, Even though it may be used on a job for the State of any of its political subdivisions.

V. MATERIALS

Article 19 Materials

Materials include all manufactured products and processed and unprocessed natural substances required for completion of the Contract. The Contractor in accepting the Contract is assumed to be thoroughly familiar with the materials required and their limitations as to use and requirements for connections, setting, maintenance and operation.

Whenever an article, material or equipment is specified and a fastening, furring, connection (including utility connections), bed or accessory is normally considered essential to its installation in good quality construction, such shall be included as if fully specified. Nothing in the Construction Specifications shall be interpreted as authorizing any work in any manner contrary to applicable law, codes or regulations (See Article 31).

A. Approval

All materials are subject to the Architect's or Engineer's approval as to conformity with the specifications, quality, design, color, etc. No work for which approval is necessary shall be contracted for, or used, until written approval is given by the Architect or Engineer. Approval of a subcontractor, as such, does not constitute approval of a material which is other than that included in the Construction Specifications.

B. New Materials

Unless otherwise specified, all materials shall be new.

C. Quality

Unless otherwise specified, all material shall be of the best quality of the respective kinds.

D. Samples

The Contractor shall furnish for approval all samples as directed. The work shall be the same as the approved samples.

E. Painting and Color

The Architect and Contractor shall jointly prepare the paint and color schedules. The Architect shall direct the exact color, texture and finish.

F. Proof of Quality

The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials either before or after installation. The Contractor shall pay for any tests as may be deemed necessary in relation to "Substitutions" (Paragraph I. below).

G. Contractor's Option

When several products or manufacturers are named in the Construction Specifications for the same purpose or use, then the Contractor shall select any of those so named. However, all of the units of a thing required for a project must be the same in material and manufacture.

H. "Or Equal", "Equal", "Approved Equal"

The above terms are used as synonyms throughout the Construction Specifications. They are implied in reference to all named manufacturers. Only materials that, in the opinion of the Engineer, are fully equal in all details of construction, methods of assembly, finish and design quality will be considered. (See A, C, E, above, and I. below.)

I. Substitutions

Should the Contractor desire to substitute another material for one or more specified by name, the Contractor shall apply, in writing, for such permission and state the credit or extra involved by the use of such material. The Engineer will not consider the substitution of any material different in type or construction methods unless such substitution effects a benefit to the County. (See A. and D. above.)

The Contractor shall not submit for approval, materials other than those specified without a written statement why such a Substitution is proposed. Approval of a "substitute" material by the Architect or Engineer when the Contractor has not designated such material is a "substitute," shall not be binding on the County nor release the Contractor from any obligations of the Contract, unless the Architect or Engineer approves such "substitutions" in writing.

J. Standard Specifications

Whenever references are made in the Contract Documents to the *Baltimore County Standard Specifications for Construction and Materials* and *Standard Details for Construction*, it shall be understood that the latest standards and/or requirements are intended and shall apply. When no specification is cited and the quality, processing, composition or method of installation of a thing is only generally referred to then:

1. For things not otherwise specified below, the latest edition of the Applicable American Society for Testing Materials Specifications shall apply.

2. For things covered by the applicable portions, the National Bureau of Fire Underwriters Code shall apply.
3. For things generally considered as plumbing and those things requiring plumbing connections, the applicable portions of the latest edition of the American Society of Mechanical Engineers Code and the Baltimore County Plumbing Code shall apply.
4. For things generally considered as heating and ventilating work and not covered by A.S.M.E. Code, the applicable portions of the latest edition of the Heating and Ventilating Guide, published by the American Society of Heating and Ventilating Engineers, and the Baltimore County Building Code shall apply.

K. Storage

The contractor shall confine apparatus and storage of materials to the "off-road" area delineated as the "Limit of Contract." The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger the safety of the structure or any part thereof.

VI. QUALIFICATION, EMPLOYEES, WORKMANSHIP, SUBCONTRACTORS AND ADVERTISING

Article 20 Qualification of Bidders

Bidders are required to be prequalified 10 days prior to bid opening, satisfactorily evidencing that they have the ability, equipment, organization and financial resources sufficient to enable completion of the work satisfactorily within the time specified in the Proposal.

Article 21 Employees and Workmanship

A. Employees

1. Qualification

Only personnel thoroughly trained and skilled in the task assigned them may be employed on any portion of the work, or they shall be removed.

2. Licensed

When County, State or Federal laws require that certain personnel (electricians, plumbers, etc.) be licensed, then all such personnel employed on the work shall be so licensed.

B. Quality of Labor

The Contractor shall employ on the work, at all times, sufficient personnel to complete the work within the time stated in the Proposal.

C. Work Areas

The Contractor shall confine the operations of his/her employees to the limits as provided by law, ordinance, permits or directions of the Office of Budget and Finance Property Management. Generally, the "off-road" area will be the same as the "limit of Contract" line.

D. Methods and Quality

1. All workmanship shall be of good quality. Whenever the method of the work or manner of procedure is not specifically stated or shown in the Contract Documents, then it is intended that the best standard practice shall be adhered to. Recommendations of the manufacturers of approved materials shall be considered as a part of Construction Specifications and all materials shall be applied, installed, connected, erected, used, cleaned and conditioned as so called for thereby. This, however, does not remove any requirement in Construction Specifications to add to the manufacturer's recommendations.
2. All materials shall be accurately assembled, set, etc., and when so required in good construction, shall be true to line, even, square, plumb, level and regularly spaced, coursed, etc. Under no circumstances, either in new or old work, shall any material be applied over another which has not been thoroughly cleaned, sanded or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.
3. All methods, procedures and results are subject to the Engineer's approval as to finished result to be obtained. However, this is not to be interpreted as placing upon the Engineer any responsibility for the "work" management which is solely the responsibility of the Contractor.

E. Joining of Work

1. The Contractor shall so schedule the work as to ensure efficient and uninterrupted progress and to hold to an absolute minimum the cutting and patching of new work. All cutting, patching and digging necessary to the execution of the work is included.
2. The Contractor shall so schedule (to include subcontracts) the construction performed by each group or trade that each installation or portion of the construction shall member with and join with all other work as required for a complete installation, all according to accepted good construction practice.

F. Superintendent

The Contractor shall keep on the work, at all times during its progress, a competent superintendent and all necessary assistants, all approved by the

Office of Budget and Finance Property Management. Prior to commencement of the work, the Contractor shall submit in writing to the Office of Budget and Finance Property Management the name and qualifications of the person to be employed as Superintendent for the execution of the Contract. A written approval or rejection will be given following review of the data. Persons who have previously proved unsatisfactory on work executed for the County, or who are without proper qualifications, will not be approved. Should the Superintendent be complained of by the Office of Budget and Finance Property Management for cause, he/she shall be removed from the work. Should it be necessary to change the Superintendent, the above procedure shall be repeated. The Superintendent will represent the Contractor. All directions given to the Superintendent shall be as binding as if given to the Contractor. Important directions shall be confirmed on written request in each case.

G. Discipline

The Contractor shall at all times enforce strict discipline and good order among his/her employees and shall not employ or permit to remain on the work any unfit person. The Contractor shall enforce all instructions relative to use of water, heat, power, no smoking, and control any use of fires, as required by law and for the Office of Budget and Finance Property Management. Employees must not be allowed to loiter on the premises before or after job working hours.

Article 22 Employment Lists

The Contractor may contact MARYLAND STATE EMPLOYMENT SERVICE, Towson, MD, 21204, if so desired, for additional labor regarding this project.

Article 23 Contractor's Supervision (Also see Article 21, Paragraph F.)

The Contractor shall constantly maintain efficient supervision of the work, using his/her best skills and coordinating ability. The Contractor shall carefully study and compare all drawings, specifications, and other instructions and check them against conditions existing or being constructed on the project. The Contractor shall report to the Engineer any error inconsistency or omission which may be discovered. (See also Article 5, Paragraph E, and Instructions to Bidders.) The Contractor shall not be held responsible for the existence or discovery of such errors or conflicts and neither shall the adjustment of such errors or conflicts be grounds for claim for extra on the art of the Contractor unless such adjustment involves work not obviously contemplated by the Contract Documents or necessary to progress of the work. The Contractor shall be responsible for the coordination of the work of all subcontractors.

Article 24 The County's Right to do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the County after three days' written notice to the Contractor may, without prejudice to any other remedy, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

Article 25 County's Right to Terminate Contract

A. Terminate Contract

The Office of Budget and Finance, Property Management, upon proof that sufficient cause exists to satisfy such action, may without prejudice to any other right or remedy, and after giving the Contractor seven (7) days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the work by whatever method may be deemed expedient, if any of the following conditions exists:

1. If the contractor should
 - a. Be adjudged a bankrupt or make a general assignment for the benefit of creditors,
 - b. Has a receiver appointed on account of insolvency.
 - c. Fails to or repeatedly and persistently refuses to supply properly skilled workers or proper materials, except in cases for which extension of time is provided,
 - d. Fails to make payment to subcontractors, or for materials and labor,
 - e. Persistently disregards laws, ordinances or the instructions of the Engineer, or
 - f. Is otherwise guilty of a substantial violation of any provision of the Contract.

2. Payment Status

In cases such as identified above, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract price shall exceed the expenses of finishing the work, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the contractor shall pay the difference to the County. The expense incurred by the County as herein provided, and the damage incurred through the Contractor's default, shall be itemized by the Engineer and a certified copy supplied to the Contractor.

Article 26 Sanitary Conveniences

- A. The Contractor shall arrange for the erection and Maintenance of temporary toilets equipped with running water and drain connection for use of employees. These conveniences shall be erected and kept clean and in good condition, as required by law, until ordered removed by the Engineer.
- B. In lieu of A. above, the Contractor may install a portable approved chemical toilet at an approved location.
- C. The permanent plumbing fixtures to be constructed under this Contract shall not be used during construction, under any circumstances.

Article 27 Subcontracts Deleted

Article 28 Relation of Contractor and Subcontractor

- A. **The Contractor agrees** to bind every subcontractor and every subcontractor agrees to be bound by the terms of the Agreement, *Baltimore County's Standard Specifications for Construction and Materials* and *Standard Details for Construction the General Conditions*, the Drawings and Construction Specifications, as far as applicable, to his/her work, including the following provisions of this Article, unless specifically noted to the contrary in the subcontract approved in writing as adequate by the Office of Budget and Finance, Property Management.
- B. **The Subcontractor agrees** to be bound to the Contractor by the terms of the Agreement, *Baltimore County's Standard Specifications for Construction and Materials* and *Standard Details for Construction, General Conditions*, Special Provisions, Construction Specifications, and to assume towards him/her all obligations and responsibilities that he/she, by those documents, assumes towards the County.
 - 1. To submit to the Contractor applications for payment in such reasonable times as to enable the Contractor to apply for payment under Article 8 of these *General Conditions*.
 - 2. To make all claims for extras, for extensions of time and for damages for delays or otherwise, to the Contractor in the manner provided in *Baltimore County's Standard Specifications for Construction and Materials* or those *General Conditions* for like claims by the Contractor upon the County, except that the time for making claims for extra cost is one (1) week.

C. **The Contractor agrees** to be bound to the Subcontractor by all the obligations the County assumes to the Contractor under Agreement, *Baltimore County's Standard Specifications for Construction and Materials, General Conditions*, Drawings and Construction Specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the County.

1. To pay the Subcontractors:

- a. Upon receipt of payment, if issued under the schedule of values described in *Baltimore County's Standard Specifications for Construction and Materials, G.P.- 9.03* or Article 8 of these *General Conditions*, the amount allowed to the Contractor on account of the Subcontractor's work, to the extent of the Subcontractor's interest herein.
 - b. Upon the receipt of payment, if issued otherwise than as in Paragraph C.1., above, so that at all times the total payments shall be as large in proportion to the value of the work done by him as the total amount certified to the Contractor is to the value of the work done by him/her.
 - c. To such extent as may be provided by the Contract Documents or the subcontract, if either of these provides for earlier or larger payments than the above.
 - d. On demand for his/her work or materials as far as executed and fixed in place, less the retained percentage, at the time the payment is requested, even though the Engineer fails to approve it for any cause not the fault of the Subcontractor.
 - e. A just share of any fire insurance money received by him/her, the Contractor, under Article 35 of these *General Conditions*.
2. To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specified in the subcontract.
3. That no claim for services rendered or materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim was originated.
4. To give the Subcontractor an opportunity to be present and to submit evidence in any manner involving his/her rights.

5. The Contractor and the Subcontractor agree that nothing in this Article shall create any obligation on the part of the County to pay to or to see to the payment of any sums to any Subcontractor.

Article 29 Interlocking Contracts

The attention of the Contractor and all Subcontractors is specifically called to the necessity of reading the Specifications covering items of the work which connect with or are dependent upon the work specified under each heading, and each Contractor executing the work called for there under shall be responsible for arranging for proper provision for connecting and coordinating his/her work with such other items.

Article 30 Advertising Signs

- A. The Contractor will furnish, erect and maintain a project sign for the duration of the project. The sign shall be placed on the site where and as directed by the Engineer. The sign shall be fastened to three posts spaced 4' apart. The posts shall be 4" x4", seven feet above ground and three feet below ground.
- B. The project sign is shown on page GC-27 in this book.

VII. LAWS, PERMITS, LICENSES, INSURANCE, AND BONDS

Article 31 Laws, Permits and Regulations

- A. Permit and Service Connections:
 1. **BUILDING PERMIT** - The County will obtain the building permit at no cost to the Contractor.
 2. **PERMANENT WATER SERVICE** - The County will apply for the water service and pay all related charges; i.e., water meter, water systems connection charge, water distribution charge and sewer systems connection charge. Total installation of the permanent water service is part of this Contract. Water service shall be installed by a County Prequalified Utility Contractor.
 3. **PLUMBING PERMIT** - The Contractor shall apply for the Permit; however, the County will pay all related charges and fees.
 4. **PERMANENT ELECTRIC SERVICE** - The Contractor shall apply for and pay for the electrical permit. The County shall obtain BGE permanent gas and electric service to the site at no cost to the Contractor.

The Contractor shall coordinate the installation of permanent gas and electric service with Baltimore Gas & Electric

Company. Both the gas and electric services shall be activated at the same time under one account number showing Baltimore County as owner. The Contractor shall be responsible for payment of consumption charges for the use of gas and electric energy obtained through the permanent service until the building is accepted by the County or until agreed upon by the County in direct coordination with the Building Services Division of Baltimore County. Charges from BGE for removal of existing electric service will be paid by the County.

5. **PERMANENT TELEPHONE SERVICE** - The County shall pay for the telephone service and systems to and in the building. The Contractor is responsible for supplying and installing all conduit, cables and junction boxes as shown on the drawings or called out in the Specifications.
 6. **CABLE** - The County shall pay for any cable television service into the building. The contractor is responsible for supplying and installing the remaining work as shown on the drawings and called out in the Specifications.
 7. **TEMPORARY SERVICES** -All temporary services, such as water, electric, telephone, etc., shall be the Contractor's entire responsibility. (Also see Article 46.)
 8. **MISCELLANEOUS PERMITS** - The Contractor shall procure any and all necessary permits not previously mentioned and pay any and all related charges and fees required and incidental to the due and lawful prosecution of the work.
- B. The Contractor shall give all notices and comply with all State and Federal laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the Drawing and Contract Specifications are at variance therewith, he/she shall promptly notify the Engineer, in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he/she shall bear all costs arising there from.

Article 32 Compensation, Liability, and Property Damage Insurance

(See Insurance Provision in Part VI of this Contract.)

Article 33 Builder's Risk Insurance

- A. The Contractor shall, at his/her own cost, insure the work and keep it insured at all times during the period of construction, and until final acceptance of it by the County, against loss or damage covered by

an "All Risk" Builders Risk type of policy. The amount of insurance shall be the 100% estimated replacement cost of the work.

- B. The policies shall be made payable to the County and the Contractor, as their interest may appear, and the policies shall be left in the possession of the Engineer, prior to the start of construction.

Article 34 Guaranty Bonds

- A. Prior to signing of the Contract, the Contractor will be required to furnish bond covering the faithful performance of the Contract and the payment of all obligations arising there under, in such form as the County may prescribe with such sureties as the County may approve. The premiums shall be paid by the Contractor.
- B. The Bond to be in the amount of the total Contract price.
- C. At the direction of the Office of Budget and Finance, Property Management, the Contractor may be required to increase the above bond. Such addition will be paid for by the County in the amount of actual cost to the Contractor.

Article 35 Damages

- A. If either party to this Contract should suffer damages in any manner because of the wrongful act or neglect of the other party or of anyone employed by him/her, then reimbursement shall be made by the other party for such damage.
- B. Claims under this clause shall be made in writing to the party liable within a reasonable time at the first observance of such damage and not later than the time of final payment, except as expressly stipulated otherwise in the case of faulty work or materials, and shall be adjusted by agreement.
- C. Should the Contractor cause damage to any separate contractor on the work, the Contractor agrees, upon due notice, to settle with such contractor by agreement or refer the matter to the Office of Budget and Finance, Property Management, who will render a decision after hearing all evidence in the matter. The Contractor shall pay or satisfy such decision.

VIII. INSPECTION AND SURVEYS

Article 36 Inspection

- A. If the Construction Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by another authority, the date fixed for such inspection. Inspections by

the Engineer shall be made promptly, and where practicable, at the source of supply. Any work covered without approval of the Engineer must, if required, be uncovered for examination at the Contractor's expense.

- B. If initial tests and/or inspections show substandard products, materials, workmanship, etc. and the Contractor elects, with the Engineer's approval, to perform additional tests and/or inspections to prove the acceptability of the substandard products, materials, workmanship etc., he/she shall perform same at his/her expense.

Article 37 Surveys

- A. The General Contractor shall, at his/her own expense, employ a registered surveyor to provide Elevation Bench Mark, and locate corners of the building and the limits of contract.
- B. The General Contractor shall, at his/her own expense, employ a competent field engineer, to give the lines and levels for the building, sidewalks and footings, etc. The Contractor will be responsible for all lines and levels and will guarantee all lines and levels as are shown on drawings.

Article 38 Unauthorized Work

Work done without lines and grades being established, work done beyond the lines and grades shown on the Plans or as established, except as herein provided, or any extra work done without written authority will be considered as unauthorized and at the expense of the Contractor and will not be measured by the Engineer, or paid for by the County. Work so done may be ordered by the Engineer to be removed and replaced at the Contractor's expense.

IX. CONSTRUCTION

Article 39 Construction Schedule

The Contractor shall hold bi-weekly "progress meetings" at the site, at a time suitable to the Engineer, at which the progress of the work shall be reported upon in detail with reference to schedules. Each interested subcontractor shall be required to have present a competent representative to report the condition of his/her branch of the work and to receive instructions. Minutes of these "progress meetings" shall be taken by the Contractor who shall type them for distribution to members of the conference, the Office of Budget and Finance, Property Management, and other interested persons. These minutes shall be received by all parties prior to the next scheduled "progress meeting."

Article 40 Protection of Work and Property

- A. All trees along the way of access shall be boxed, also all trees surrounding the building which are liable to injury by the moving, storing and working up of materials. No permanent tree shall be used for attachment of any ropes or derricks. Every public way, catch basin, conduit, tree, fence or things injured in carrying out this Contract, shall be replaced and put in good condition, unless the same shall be permanently done away with by order of the Engineer.
- B. The Contractor shall erect and properly maintain at all times as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling material.
- C. In an emergency affecting the safety of life, or of the work, or of the adjoining property, the contractor, without special instruction or authorization is hereby permitted to act, at his/her discretion, to prevent such threatened loss or injury, and he/she shall so act, without appeal, if so instructed or authorized. Any compensation claimed by the Contractor on account of emergency work shall be determined as outlined in Article 11.

Article 41 Shoring, Bracing and Sheeting

- A. The Contractor shall do all necessary shoring, bracing and sheeting required, or as directed by the Engineer, to carryout the work, install the foundations and other building construction, to protect the street, sidewalks and all adjoining buildings and property. He/she shall thoroughly brace and protect all earth banks sides of pits, trenches, and other excavations to prevent danger to persons or structures, and to prevent injurious cavings or erosion of any sort. Shoring and sheeting shall be removed after, or as, the walls are built and properly set.
- B. Full responsibility for both the design (by an Engineer licensed in Maryland) and the execution of all shoring, bracing, and sheeting work shall rest upon the contractor. While the Engineer shall be fully advised of all details for such work before the work itself is executed, this shall not in any way relieve the Contractor for full responsibility for all damage or expense arising from faulty installation of the said work of shoring, bracing, or sheeting.

Article 42 Tests

- A. Soils testing shall be performed by an independent testing firm arranged and paid for by the County.

- B. Materials testing shall be performed by an independent testing firm, paid for by the Contractor, which has previously been approved by the County and Architect/Engineer. Certified copies of all such test reports shall be submitted to the Engineer for approval.

Article 43 Cleaning Up

- A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his/her employees or work, and at the completion of the work, shall remove all his/her rubbish from and about the project site, and all his/her tools, scaffolding and surplus material.

In case of dispute, the County may remove the rubbish and charge the cost to the several contractors as the Engineer shall determine to be just.

- B. All debris shall be kept sprinkled to reduce dust and shall be promptly removed from the building, and no combustible materials shall be stored against perimeter walls.
- C. The Contractor shall clean entirely the building as it is completed, wash all windows, scrub all floors at least once, and leave all floors free from spots and blemishes. The interior of the building and the project area shall be left "broom clean," or its equivalent.

Article 44 As-Built Drawings

The Contractor shall, as the project progresses, neatly record on a set of white prints any changes and all revisions to the work wherever they shall differ from the Contract Drawings. Upon completion of the work, the Contractor shall turn over to the Architect this set of prints.

Article 45 Drainage and Pumping

The Contractor shall remove all water, including rain water, encountered during the entire progress of the work, using pumps, drains or other methods approved by the Engineer. Excavations and the project site shall be kept free from water until all backfilling is completed. The water shall be discharged to catch basins, or other drainage points as directed by the Engineer.

Article 46 Temporary Water, Electric and Other Services

- A. The Contractor shall arrange for and pay for the installation of temporary connection to the County's water mains, including all incidental fees and expenses for water supply during construction of the project, and shall pay for all water used. Wasting of County water will not be permitted.

- B. The Contractor shall arrange for and pay for temporary electric light and power service required during construction of the project, and shall pay for all electricity used. Gasoline or other torches for lighting will not be permitted.
- C. The Contractor shall provide and pay for any other temporary services which may be required for the satisfactory completion of the project.
- D. The Contractor shall provide, at his/her own expense, all cold weather protection, temporary heat and fuel as necessary to carry on the work expeditiously during inclement weather, to protect work and materials against injury from dampness and cold, to dry out the building and provide suitable working conditions. Refer to other sections for temperatures required for work under the various trades

The methods of heating and type of fuel and equipment used shall be subject to approval by Engineer.

With special permission, in writing, permanent heating system may be used to dry out building and provide suitable working conditions in all or various parts thereof as soon as practicable. If used, Contractor shall be responsible for use of permanent heating system for purpose described and all costs of fuel, attendance, etc. in connection therewith shall be borne by him/her. Such use shall not relieve Contractor of his/her responsibility to turn over system to Owner in perfect condition on completion of project, including the removal of all dust of construction from air handling units, etc., the replacing of all filters, etc., nor shall it shorten stipulated guarantee period which will commence upon the date of final acceptance of the work.

Article 47 Connecting to Existing Utilities

The Contractor shall, at his/her own cost and expense and as part of this work under the Contract, furnish all labor, materials, tools, and appliances, and do all work required for making connections to existing storm drains, sanitary sewer, water, gas and electric service connections, as shown on drawings, and the cost of making such connections shall be included in his/her bid.

Article 48 Existing Utilities Shown on Plans

Water mains, gas mains, storm drains, sanitary sewers, and other utilities are shown on the Plans, in accordance with the best information available, for the information of the Contractor. The County assumes no responsibility for accuracy or completeness of the information shown. Existing mains and services shall be carefully protected and any damage to them caused by the work shall be immediately repaired to the satisfaction of the Engineer by the Contractor at his own expense, using materials of the quality and kinds damaged.

X. MISCELLANEOUS ADDENDA

Article 49 Holidays

The word "holidays" used in these Contract Documents shall be taken to mean the below listed holidays, which in Baltimore County, occur as shown below:

January 1	New Year's Day
3rd Monday in January	Martin Luther King's Birthday
3rd Monday in February	President's Day
4th Monday in May	Memorial Day
June 19	Juneteenth Independence
July 4	Independence Day
1st Monday in September	Labor Day
2nd Monday in October	Indigenous Peoples' Day
November 11	Veteran's Day
4th Thursday in November	Thanksgiving Day
December 25	Christmas
All Days of General Elections	

If any holiday occurs on Sunday, the following Monday shall be considered a holiday. If the holiday occurs on Saturday, the Friday immediately preceding shall be considered a holiday.

Article 50 Buy American Steel Act

The State of Maryland has approved House Bill No. 1659 to "Buy American Steel" for all Public Works projects in the State of Maryland, effective July 1, 1978. Compliance with Article 20.17 Metal Pipe (Page 100) and Article 20.18 Metal for Structures (Page 102) in the *S.H.A. Specifications for Materials, Highways, Bridges and Incidental Structures* dated March 1968 will satisfy this condition. Also see *Baltimore County's Standard Specifications for Construction and Materials* Section GP 7.28.

Article 51 Guarantee

- A. The Contractor guarantees all work against faulty or imperfect materials, against all imperfect or careless and/or unskilled workmanship, against all leaks and against all mechanical and electrical failure of equipment for a period of two (2) years from the date of acceptance of the project by the County. See other Sections of this Specification for other guarantees.
- B. The Contractor shall remove, replace or re-execute, without cost to the Owner, any work found to be imperfect during the guarantee period.

Article 52 Offices and Telephones

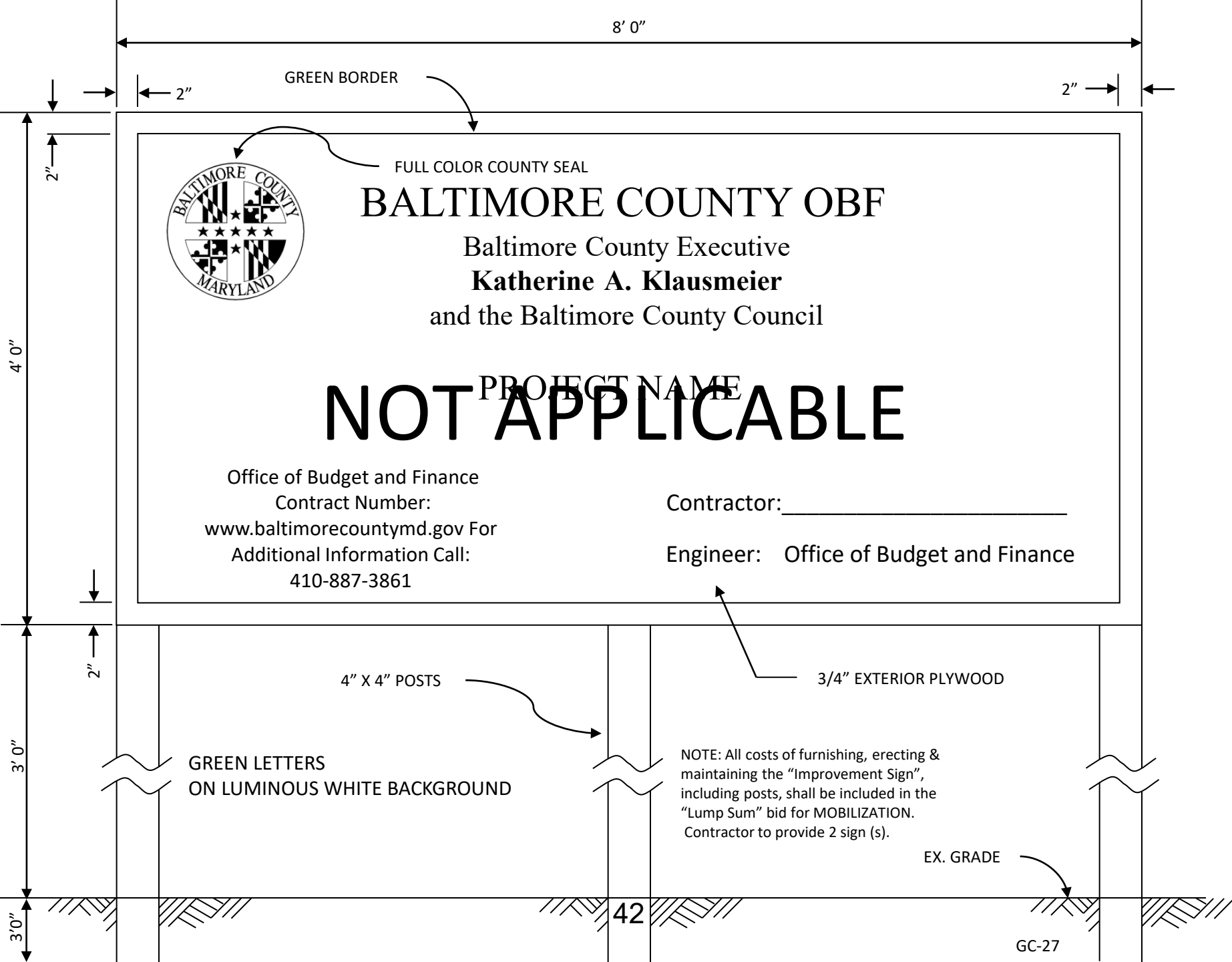
- A. The Contractor shall erect and maintain upon the project site, and where directed by the Engineer, suitable offices for his/her own use and that of the Engineer.

- B. A room of adequate size shall be provided and maintained in the Contractor's office to be used for "Progress Meetings," which frequently involve fifteen (15 or more persons). This space shall be so arranged that they can be held without interference with or from the other office or supervisory work. The room shall be 300 sq. ft. minimum and 10 ft. minimum width.

These offices shall be provided with adequate heating and lighting, all at the expense of the Contractor. In addition to the above requirements, air-conditioning will be required, the cost of which is to be included in the lump sum bid price. The system must be capable of maintaining a temperature of 80 degrees F dry bulb and approximately 50% relative humidity in the conditioned area when outside temperatures are 95 degrees F dry bulb and 78 degrees F wet bulb.

- C. The Engineer's office shall meet or exceed all requirements for a Type 1 office in accordance with *Baltimore County's Standard Specifications for Construction and Materials*, Section 103 Engineer's Office.

The Contractor shall provide telephone and FAX service in the Office of the Engineer. The Contractor shall pay all costs of installation and all charges for local and Baltimore City calls, but will not be expected to pay for long distance calls made from the Engineer's Office.



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ELECTRICAL

COMMON WORK RESULTS FOR ELECTRICAL

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS & CABLES

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

LOW VOLTAGE ELECTRICAL DISTRIBUTION

WIRING DEVICES

SECTION 01 01 00

SUMMARY OF WORK

PART1 - GENERAL

1.1 SECTION INCLUDES

A. Description of the Work:

1. Mechanical Systems:
 - a. Provide replacement of split system HVAC system serving the offices and break room of the Sign & Signal shop area.
 - b. The existing AHU, Air Cooled Condensing unit along with VAV boxes with hot water reheats coils and ductwork shall be completely removed.
 - c. Remove existing ceiling tiles within the area of work as required to replace the HVAC system. The existing ceiling grid shall remain. Sections of the grid may be removed as required to replace the HVAC system and then reinstalled.
 - d. New ceiling tiles shall be provided in the corridor as shown on the drawings.
 - e. Existing ceiling tiles within the offices and break room shall be reinstalled when work is complete. Replacement of damaged ceiling tiles during the project shall be the responsibility of the contractor.
 - f. Install and VRV/VRF system to serve the offices spaces as shown on the contract drawings. Provide all system controls and accessories for a complete and operable system.
 - g. HVAC system shall be completely integrated with the existing Building Automation System (BAS).

B. Project Administration:

1. The Contractor is responsible for project budget, project construction schedule, project coordination, project administration and overall site management, including safety and security.
2. The Contractor shall be responsible for coordination of demolition and new construction work between various trades.
3. Contractor shall comply with the directives of the Owner and respond to the comments from the Engineer for this Project.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions shall apply to the Work of this Section.

1.3 RELATED SECTIONS

- A. Division 0 and Division 1 Specification Sections.

1.4 REGULATORY REQUIREMENTS

- A. Building Code of the State of Maryland and Baltimore County adopted codes.

SUMMARY OF WORK

1. Comply with requirements of International Building Code and adopted Supplements.
 - B. The State Fire Prevention Code (COMAR 12.03.01).
 - C. Regulations Governing Construction of facilities for the Handicapped by the State of Maryland (COMAR 05.02.02), and the “ADA Accessibility Guidelines for Building and Facilities” published by the U.S. Department of Justice, 28 CFR Part 36, as amended to date.
 - D. Life Safety Code - NFPA 101, and NFPA 1, inclusive of all supplements and modifications.
- 1.5 QUALITY CONTROL and QUALITY ASSURANCE
- A. Coordinate with requirements of Division 1 Specification Sections.
 - B. The Contractor is fully and wholly responsible for Quality Control of the Project.
 - C. The Contractor shall employ a full time, on-site Quality Control Manager (QCM) for the duration of the contract to provide and implement Quality Control measures and services identified in the Contract Documents and owner.
- 1.6 USE OF PREMISES
- A. General:
 1. Confine operations to areas indicated by Contract Documents.
 2. Do not unreasonably encumber site areas with materials or equipment.
 3. When required by other construction activities, relocate, move and/or remove materials and temporary facilities as directed by the Owner.
 4. Parking for contractor personnel on site, however, will be limited.
 - B. Contractor Use of Premises
 1. Coordinate use of premises under direction of Owner.
 2. Other concurrent and contiguous contracts will be ongoing during the term of this Contract.
 3. Follow directions provided by the Owner regarding locations of temporary facilities and utilities, storage areas, stockpile areas, and staging areas to prevent interference with Work by other Contractors.
 4. Assume full and sole responsibility for protection and safekeeping of materials and products under this Contract.
 5. When not indicated, the Owner will assist the Contractor in identifying on-site staging and storage areas or work areas needed for operations under this Contract.
 6. If on-site storage areas are not available, the Contractor shall obtain and pay for use of off-site storage or work areas.
 - C. Related Contract Documents:
 1. Contractor may contact the Owner to review and/or obtain copies of other site documents, past renovation projects, etc. prepared under separate contracts.
 2. Duplication costs of other such documents are the responsibility of the

SUMMARY OF WORK

Contractor.

1.7 CONSTRUCTION PERIOD

- A. The contractor shall submit to the owner and the engineer a project Base Line Construction Schedule within thirty (30) days on contract award.
- B. Do not exceed the number of calendar days established from Notice-to-Proceed (NTP) date based on the Contract Time and Completion Date and as further defined in the General Conditions and the Construction Agreement between the Owner and the Contractor.
- C. All work will be totally complete by the established Substantial Completion date and dates indicated herein.
- D. In accordance with the General Conditions the Final Inspection Date shall be established following the Substantial Completion Date. The Final Inspection Date shall be established between the Owner and the Contractor and shall not exceed thirty (30) calendar days beyond the established Substantial Completion Date nor shall the Final Inspection Date be after the Contract Time and Completion Date established for this project.
 - 1. The Contractor shall identify the Substantial Completion date in the initial and all subsequent cost and labor loaded CPM Schedules.
- E. Thirty (30) calendar days following NTP the Contractor shall submit to the Owner and the Engineer the cost and labor loaded CPM schedule and "Shop Drawing" Submittal Log in duplicate. Submittal Log shall be a report generated directly from the cost and labor loaded CPM schedule and shall indicate the early and late start and finish dates for each Submittal item. No Submittals may be submitted for review and approval until the Contractor's Shop Drawing Submittal Log includes all Project Submittals, and reviewed and approved by the Owner and Engineer as contract compliant.
- F. Fourteen (14) calendar days following CPM schedule and Submittal Log review and approval by the Owner and Engineer, initiate submittals, order materials, perform field investigations, secure clearances, store materials in designated staging areas, and other related initial activities.
- G. The Contractor shall notify the Owner in writing seven (7) calendar days in advance of the exact day construction is to start within the Project limits.
- H. Time Extensions:
 - 1. Comply with General Conditions for severe weather conditions.

1.8 CONTRACTOR'S COORDINATION OF OTHER WORK

- A. Owner may contract for other work to be performed in the building or on the site during the duration of this contract. The contractor this project shall coordinate and cooperate with work performed by other contractors who may be required to work during the same periods.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

SUMMARY OF WORK

3.1 CONTRACT COMPLETION

- A. The Contractor is ultimately responsible for a complete, operational, functional, and final project that includes:
 - 1. All portions of the work as defined in the Contract Documents for this Project.
- B. If scheduled work must extend beyond the required completion dates, the Contractor must make all provisions to complete the remaining work in the timeliest fashion. Such means as overtime, double shifts, night/weekend work shall be employed to reach final completion of each Phase.

END OF SECTION 01010

SECTION 01 25 20

REQUEST FOR INFORMATION (RFI)

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for handling and processing Request for Information of the Contract Documents.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 DEFINITIONS

- A. Request for Information (RFI): Written request by Contractor to Engineer for interpretation of Contract Documents when intent of the Contract Documents is not reasonably inferable, and an interpretation of Contract Documents by Engineer is required in advance of performing Work.

1.5 REQUEST FOR INFORMATION

- A. Proper RFI: An RFI is Proper when prepared by Contractor in accordance with requirements of this Section.
 - 1. It is the responsibility of the Contractor to make a reasonable and detailed review of the Contract Documents prior to the issuance of an RFI to the Engineer to determine that requested Information is not readily inferable from the Contract Documents.
 - 2. When Contractor believes an RFI may result in a change in Contract Sum, Contract Time, or both, do not submit an RFI.
 - a. Submit a Request for Proposal (RFP) in accordance with Division 1 - Section 01 25 90, "Modification Procedures."
- B. Improper RFI: RFI not prepared in accordance with requirements of this Section.
 - 1. RFI that requests an interpretation of Contract Documents that could have been reasonably inferred from the Contract Documents.
 - 2. An Improper RFI may be subject to rejection and will be returned to Contractor without action.
 - 3. The decision of the Architect in the determination of an Improper RFI is final and binding.

REQUEST FOR INFORMATION

- C. Reasons an RFI may be determined to be Improper include, but are not limited to, the following:
1. Request for substitution of product, performance or standard of quality.
 2. Request for a change to the Contract Documents to respond to job site conditions or activities.
 3. Request when response may result in adjustment of Contract Sum.
 4. Request when response may result in adjustment of Contract Time.
 5. Request for a clarification of a required Submittal or Shop Drawing, either before or after such Submittal review by the Architect.
 6. Handwritten RFI.
 7. Request approval of submittals.
 8. Request approval of substitutions.
 9. Request coordination of various materials and systems indicated on Contract Documents with field conditions and with each other.
 10. Request submitted by someone other than Contractor.
- D. Proper Engineer prepared RFI Response:
1. Response that is a Clarification and/or a Minor Modification in the Work in accordance with Division 1 - Section 01 25 90, "Modification Procedures."

PART 2 - PRODUCTS

2.1 REQUEST FOR INFORMATION FORM

- A. Submit typewritten RFI on form similar to the form included at end of this Section. Handwritten RFI forms are not acceptable and are an Improper RFI.
1. Electronic copy of the sample RFI form will be provided to Contractor upon written request.

2.2 REQUEST FOR INFORMATION LOG

- A. Maintain current and accurate Request for Information Log for duration of Contract as follows:
1. List each RFI issued.
 2. Include RFI number, date issued, subject, number of attachments issued and received (if any), and status as follows:
 - a. Include date received.
 - b. Awaiting response from Architect.
 - c. Additional information required.
 - d. Contractor to provide additional information to Architect.
 3. Do not list Improper RFI's returned to Contractor.
 4. Submit current copy of RFI Log to Architect at Owner's Progress Meeting.

PART 3 - EXECUTION

3.1 PREPARATION, SUBMITTAL, AND REVIEW PROCEDURE

- A. Preparation: Complete form. Provide information in all boxes above dashed line.

REQUEST FOR INFORMATION

1. Number each RFI sequentially.
 2. Do not include subcontractor's RFI number on RFI form.
 3. Each attachment page to an RFI shall bear RFI number, date, and Contractor's signature.
 - a. Number each attachment page consecutively.
 4. Prepare and submit a Proper RFI on behalf of subcontractors, material suppliers, fabricators and other Contractor consultants.
 5. Prepare a separate form for each subject.
 6. Do not submit multiple-subject RFI's.
- B. Submittal: Submit signed original RFI by email.
- C. Review: Allow seven (7) days, from time of receipt, to review and respond. Plan and schedule Work accordingly. No extension of the Contract Time will be authorized because of failure to provide RFI's in advance of the Work to permit processing.
1. Additional time may be required to review and respond to an RFI.
 2. Architect will advise Contractor within three (3) days following receipt of an RFI when an RFI will require more than seven (7) days to provide a response.
 3. An RFI may require additional review and response time for the following reasons:
 - a. Where RFI requires multiple discipline review, coordination and response.
 - b. When RFI is complicated and requires review and response from an Owner, Using Agency, and authority having jurisdiction, product vendor, or another entity other than the A/E.
 - c. Concurrent review of multiple RFI's.
 - d. Additional information is required from the Contractor in order to review and respond to an RFI.
 - e. Receipt of Improper RFI.

END OF SECTION

REQUEST FOR INFORMATION

TO: _____

RFI No: _____

Attention: _____

DATE: _____

PROJECT NO: _____

PROJECT NAME: _____

PROJECT LOCATION: _____

SUBJECT: _____

SPEC. SECTION: _____

DRAWING NO: _____

REQUEST:

PROPOSED SOLUTION:

DATE RESPONSE REQUIRED: _____

BY: _____

RESPONSE:

BY:

DATE: _____

SECTION 01 25 00

MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for handling and processing modifications to the Contract.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 SUBMITTALS

- A. Submit name and address of Contractor's representative authorized to receive and accept changes and responsible for informing others in Contractor's employ of changes to the Work at contract signing.
- B. Change Order Form: Submit Change Orders on forms provided by the County.
- C. Procedure for submitting Proposed Change Order (PCO) and Approved Change Order (ACO) comply with requirements of this Section and Owner's written instructions.
- D. Request for Proposal (RFP):
 - 1. Engineer or Owner may initiate an RFP that may or may not affect Contract Documents, Contract Sum, or Contract Duration.
 - 2. An RFP may be requested in instances where the Owner wishes to price Work before deciding whether or not to proceed.
 - 3. Within ten (10) days following receipt of an RFP, Contractor will price the Work and forward a PCO to Engineer and Owner for review and evaluation.
 - 4. Clarifications, Minor Modifications, and Supplements shall be assigned consecutive numbers by the Engineer commencing with number 001.
 - a. For example: PCO-001, etc.

1.5 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND/OR CONTRACT TIME

- A. Maintain detailed records of Work done on a Time and Material (T&M), or Force Account basis.
- B. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.

CONTRACT MODIFICATION PROCEDURES

- C. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
- D. Provide the following additional data to support computations at time of submission:
 - 1. Quantities of products, labor, material, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.
- E. Support each claim for additional costs, and for Work done on a Time and Material (T&M) Force Account basis, with additional information:
 - 1. Origin and date of claim.
 - 2. Dates and times Work was performed, and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.6 PRELIMINARY PROCEDURES

- A. Owner or Architect may submit a Request for Proposal (RFP) to Contractor that includes:
 - 1. Detailed description of change with supplementary or revised Drawings and Specifications.
 - 2. The projected time for executing the change, with a stipulation of any overtime Work required.
 - 3. The period of time during which requested price will be considered valid.
- B. Contractor may initiate a PCO as a Request for Substitution by submittal of a written request to Architect describing proposed Change with a statement of reason for Change, and effect on Contract Sum and Contract Time with full documentation and a statement of effect on Work of separate contractors.
 - 1. Document Request for Substitutions in compliance with Division 1 - Section 01 63 00 "Product Substitution Procedures".

1.7 CONSTRUCTION CHANGE DIRECTIVE (CCD)

- A. Architect may issue a CCD, signed by Owner, instructing Contractor to proceed with a Change in Work, for subsequent inclusion in Approved Change Order.
- B. CCD will describe changes in the Work and will designate method of determining any change in Contract Sum or Contract Time.
- C. Promptly execute the change in Work.

1.8 LUMP SUM CHANGE ORDER

CONTRACT MODIFICATION PROCEDURES

- A. Work will be based on negotiated Request for Proposal, Contractor's lump sum quotation or Contractor's request for a Change Order as reviewed by Engineer, negotiated and approved by Owner.

1.9 TIME AND MATERIAL AND FORCE ACCOUNT CHANGE ORDER

- A. Submit itemized account and supporting data after completion of change, within time limits in General Conditions of the Contract.
- B. Engineer and Owner will determine the change allowable in Contract Sum and Contract Time as provided in General Conditions of the Contract.

1.11 EXECUTION OF CHANGE ORDERS

- A. Engineer and Owner will issue Change Orders for signatures of parties as provided in General Conditions of the Contract.

1.12 MBE PARTICIPATION

- A. Prime Contractors/General Contractors should achieve the maximum level of MBE participation possible in the change order scope of work. At a minimum, MBE goals and subgoals (if any) that were approved for the base bid and alternates included in the award of contract also apply to all change orders. These will either be the original goal and subgoals specified, or the revised goal and subgoals if a request for waiver was approved with the award of the contract.

1.13 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Within seven days of receipt of an ACO, revise Schedule of Values and Application for Payment forms to record each Authorized Change Order as separate line item and adjust Contract Sum as shown on Change Order and resubmit to Engineer and Owner.
- B. Within seven days of receipt of an ACO, revise Progress Schedules to reflect any change in Contract Time for items of Work affected by change, and resubmit to Engineer and Owner.
- C. Within seven days of receipt on an ACO enter changes in Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

CONTRACT MODIFICATION PROCEDURES

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contract Drawings and General Provisions of the Contract, including the Baltimore County General Conditions and Instruction to Bidders apply to work specified in this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Submittals Schedule.
 - 2. Submit the Schedule of Values to Engineer within five (5) days of Notice to Proceed (NTP).
 - 3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Project Number:
 - c. Name of Engineer.
 - d. Engineer's project number.
 - e. Contractor's name and address.
 - f. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

PAYMENT PROCEDURES

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payments shall be submitted to Owner. The period covered by each Application for Payment is one month, ending on the last day of the month.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 5 signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

PAYMENT PROCEDURES

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Submittals Schedule (preliminary if not final).
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.
 7. Copies of building permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report.
 10. Report of preconstruction conference.
 11. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 5. AIA Document G707, "Consent of Surety to Final Payment."
 6. Evidence that claims have been settled.
 7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PAYMENT PROCEDURES

END OF SECTION

PAYMENT PROCEDURES

01 29 00 - 4

SECTION 01 29 20

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative procedures and requirements for preparation and submittal of Schedule of Values.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 CONTENT

- A. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a qualified document to assist in the determination for computing values for Progress Payments as extracted/determined from the cost loaded CPM Construction Schedule. Identify each line item by number and title of major Specifications Section. Entries shall match data on Schedule of Values.
- B. Round off values to nearest dollar.
- B. Indicate material cost separate from related labor cost.
- C. For each major subcontract, list products and operations of that subcontract as separate line items.
- D. Include Work Allowances within line item of Work.
- E. Include amounts of Change Orders and Construction Change Directives issued prior to last day of construction period covered by application
- F. List Contingency Allowance and Inspection and Testing Allowances, in the specified monetary amount for each allowance.
- G. Coordinate and use naming and numbering as extracted/determined listings from the cost loaded Contractor's CPM Construction Schedule.
- H. Component listings shall each include a directly proportional amount of Contractor's overhead and profit.

SCHEDULE OF VALUES

- I. For items on which payments will be requested for stored products, list sub-values for cost of stored products, with taxes listed separately.
- J. The sum of values listed shall equal total Contract Sum.
- K. Include the following Schedule of Values items as determined by the Owner for the Work:
 - 1. Record Documents:
 - 2. Operation and Maintenance Manuals:
 - 3. Operation and Maintenance Training:

1.5 SUBMITTAL

- A. Submit the Schedule of Values within five (5) days of NTP.
- B. Form and content shall be acceptable to the Owner's Field Project Manager.
- C. Transmit under transmittal letter.
- D. Identify Project by title and number; identify Contract by number.

1.6 SUBSTANTIATING DATA

- A. When the Counties Field Project Manager and/or Engineer requires substantiating information, submit data justifying line-item amounts in question within three (3) days of the request.
- B. Provide one copy of data with cover letter for each copy of Application.
- C. Show Application number and date, and line item by number and description.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SCHEDULE OF VALUES

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Administrative and supervisory requirements necessary for coordinating construction operations including, but not limited to:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Administrative and supervisory personnel.
 - 4. Cleaning and protection.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.4 RELATED SECTIONS

- A. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 - Construction Progress Documentation for preparing and submitting the Contractor's Construction Schedule.
 - 2. Division 1 - Execution Requirements for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control joints.
 - 3. Division 1 – Section 01 77 00 "Contract Closeout Procedures" for coordinating contract closeout.
 - 4. Division 1 - Section 01 31 20 "Project Meetings".
 - 5. Division 1 - Section 01 33 00 "Submittal Procedures".
 - 6. Division 1 – Section 01 56 90 "Construction Cleaning".
 - 7. Division 1 – Section 01 65 00 "Transportation and Handling".
 - 8. Division 1 – Section 01 66 00 "Storage and Protection".
 - 9. Division 1 – Section 01 74 00 "Final Cleaning".
 - 10. Division 1 - Section 01 77 00 "Contract Closeout Procedures".
 - 8. Division 1 - Section 01 78 10 "Project Record Documents".
 - 9. Division 1 - Section 01 78 30 "Operation and Maintenance Data".
 - 10. Division 1 - Section 01 78 50 "Warranties and Bonds".

1.5 COORDINATION

- a. Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Contractor shall

PROJECT MANAGEMENT & COORDINATION

coordinate its operations with all other operations, included in different Sections that depend on each other for proper installation, connection, and operation.

- b. Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, including different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain best results where installation of one part of Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Coordinate scheduling, submittals, and Work of various Sections to assure efficient and orderly sequence of installation of interdependent elements.
 - 4. Make adequate provisions to accommodate items scheduled for later installation.
 - c. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for Owner and separate subcontractors where coordination of their work is required.
 - d. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of Work. Such administrative activities include, but are not limited to:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-installation conferences.
 - 7. Project Record Documents.
 - 8. Project closeout activities.
- 1.6 Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
- e. Salvage materials and equipment involved in performance of, but not actually incorporated in, Work.
 - f. Equipment: Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
 - g. Spaces: Coordinate space requirements and installation of mechanical, electrical, and other Work indicated diagrammatically.
 - h. Resolve routing and space allocations before Work is started in order to prevent interference and loss of time.

1. Assist in apportioning space conditions to make satisfactory adjustments where installed work in close proximity to work of other contractors will interfere with other work.
- i. Follow routing indicated for pipes, ducts, and conduits as closely as practicable. Make runs parallel with lines of building.
- F. Adjust location of pipes, equipment, fixtures, and the like, to avoid encountered and anticipated interference.
 1. Determine exact route and location of each pipe and piece of equipment prior to installation.
 2. Make offsets, transitions and changes in direction of pipes as required to maintain proper headroom and pitch of sloping lines. Provide air vents and drains as required to effect offsets, transitions, and changes in direction.
- G. Work Under Separate Contracts: Ascertain nature and extent of work under separate contracts. Coordinate work under separate contracts and cooperate with other Contractors to minimize interference.
 1. In event Work under this Contract obstructs or impedes passage of work of others, remove such obstructions and impediments expeditiously and make provisions to prevent delay and provide access for others.

1.7 CONTRACTOR'S COORDINATION

- A. Coordinate openings and locations for the work between various Sections to include, but not necessarily limited to the following:
 - a. Plumbing
 - b. Electrical
 - c. Mechanical
- B. Staff Names: Fourteen days following Notice-To-Proceed submit list of Contractor's principal staff assignments, including Superintendent and other personnel in attendance at Site.
 1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.
 2. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 3. Post copies of list in Project meeting room, temporary field office, and by each temporary telephone.

1.8 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
- B. Include special personnel required for coordination of operations with other contractors.

PROJECT MANAGEMENT & COORDINATION

1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within seven days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation 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 Engineer 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 Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 1. Record significant conference discussions, agreements, and disagreements.
 2. 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.
- C. Coordination Meetings: Conduct Project coordination meetings at bi-weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

PROJECT MANAGEMENT & COORDINATION

1. Attendees: In addition to representatives of Owner, 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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PROJECT MANAGEMENT & COORDINATION

SECTION 01 31 20

PROJECT MEETINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Scheduling and administration requirements for Owner's Progress Meeting.
- B. Scheduling and administration requirements for Contractor's Progress and Site Coordination Meeting.
- C. Scheduling and administrative requirements for Contractor's Pre-installation Conferences.
- D. Administrative requirements for Contractor's Daily Construction Progress Reports.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 GENERAL

- A. Record all meetings and conferences and issue meeting minutes as indicated.
- B. Issue meeting minutes to Owner, Architect, Contractor and conference participants through the Contractor.

1.5 Distribute copies of all meeting minutes to Specialty Subcontractors.

1.6 OWNER'S PROGRESS MEETING

- A. Owner's Progress Meeting will be held on a mutually agreed upon weekday of every other week for duration of Contract.
- B. Owner's Progress Meeting will be held in Contractor's on-site conference room.
- C. The following individuals and agencies shall attend each Owner's Progress Meeting:
 - 1. Owner and/or the Owner's Field Project Manager.
 - 2. Engineer and it's consultants.
 - 3. Contractor's Project Manager.
 - 4. Contractor's Field Engineer.
 - 5. Other subcontractors to the Contractor, when required for discussion of progress, or when requested.

PROJECT MEETINGS

- C. Contractor will administer record and distribute Owner's Progress Meeting Minutes.
- D. Progress Meeting Minutes will be issued within seven (7) days following Owner's Progress Meeting.
- E. Agenda:
 - 1. Review of minutes of previous meeting.
 - 2. Review of Work progress and on-site security.
 - 3. Review of Contractor's Request for Information.
 - 4. Field observations, problems, and decisions.
 - 5. Review of Submittals, Schedule and status of Submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Planned or requested interruptions to utilities or services, or to Owner's use of the building.
 - 11. Coordination of projected progress.
 - 12. Maintenance of quality and work standards.
 - 13. Effect of proposed changes on progress schedule and coordination.
 - 14. Other business relating to Work.
- F. Contractor Prepared Documents:
 - 1. The Contractor's Project Manager shall provide documents containing representative information that Contractor shall prepare and distribute to each attendee at the start of each Owner's Progress Meeting, to include:
 - a. Prior Owner's Progress Meeting minutes prepared by Engineer.
 - b. Schedule Narrative:
 - 1) Description of work by trade or system.
 - 2) Describe past two-week's effort and next four weeks effort.
 - 3) Indicate where four-week scheduled tasks were not accomplished and report on methods to be employed by Contractor to recover schedule slippage.
 - 4) Narrative to include CPM Schedule task identifier, task description, task duration and percent complete (planned and actual) per week.
 - c. Look-ahead Schedule: Two-week Look-Back and four-week Look-Ahead Gantt Bar Chart developed from Owner-approved CPM Construction Schedule.
 - d. Request for Information Log (RFI).
 - e. Approved Change Order Log (ACO).
 - f. Shop Drawing and Product Submittal Log.

1.7 CONTRACTOR'S COORDINATION MEETING

- A. On-site Contractor Coordination Meeting will be held every other week for duration of Contract,

PROJECT MEETINGS

- B. Contractor's Coordination Meeting will be held in on-site.
- C. Contractor will administer record and distribute Contractor Coordination Meeting Minutes.
 - 1. Issue Contractor Coordination Meeting Minutes within five (5) days following the meeting with copies distributed to Owner, Owner's Field Project Manager, Engineer, and all attendees.
- D. The following individuals and agencies will attend each Contractor Coordination Meeting:
 - 1. Owner and/or Owner's Field Project Manager.
 - 2. Contractor's Project Manager.
 - 3. Contractor's Field Engineer.
 - 4. Contractor's Project Superintendent.
 - 5. Contractor's specialty subcontractor Project Manager and suppliers as appropriate to the agenda.
- E. Minimum Agenda:
 - 1. Review of minutes of previous meeting.
 - 2. Review of Work progress and on-site security.
 - 3. Review of Contractor's Request for Information.
 - 4. Review of Contractor's Request for Information Log.
 - 5. Field observations, problems, and decisions.
 - 6. Identification of problems that impede planned progress.
 - 7. Review of submittals schedule and status of submittals.
 - 8. Review of off-site fabrication and delivery schedules.
 - 9. Maintenance of progress schedule.
 - 10. Corrective measures to regain projected schedules.
 - 11. Planned progress during succeeding work period.
 - 12. Coordination of projected progress.
 - 13. Maintenance of quality and work standards.
 - 14. Effect of proposed changes on progress schedule and coordination.
 - 15. Other business relating to Work.

1.8 SITE COORDINATION MEETING

- A. In addition to Owner's Progress Meetings and Contractor Coordination Meetings, Contractor may be required to attend Owner's Site Coordination Meeting.
- B. Site Coordination Meeting will be held in the on-site in a designated conference room.
- C. Contractor will receive minimum 24-hour advance notification of an Owner's Site Coordination Meeting by Owner or Owner's Field Project Manager.
- D. Owner's Field Project Manager will administer record and distribute Site Coordination Meeting.
- E. Meeting Minutes will be issued within five (5) days following Site Coordination Meeting to Owner, Engineer, and Contractor for subsequent distribution.

PROJECT MEETINGS

1.9 PREINSTALLATION CONFERENCES

- A. When required in individual Specification Section, Contractor shall advise Engineer and Owner's Field Project Manager in writing of a Preinstallation Conference a minimum of 14 days prior to scheduled commencement date of the Work.
- B. Preinstallation Conference shall be conducted a minimum of seven days prior to scheduled commencement date of the Work.
- C. Preinstallation Conferences shall be held at on-site conference room.
- D. Contractor shall prepare agenda, conduct conference, record minutes, and distribute meeting minutes within five (5) days following the conference but not later than three (3) days prior to commencement of Work.
- E. Attendees will include:
 - 1. Contractor's Project Manager.
 - 2. Contractor's Field Engineer.
 - 3. Owner and/or Owner's Field Project Manager.
 - 4. Engineer.
 - 5. Entities directly affecting, or affected by, work of the Section, including but not limited to:
 - a. Subcontractor Superintendent.
 - b. Material vendors.
 - c. Trade installers.

1.10 DAILY CONSTRUCTION PROGRESS REPORTS

- A. Prepare Daily Construction Progress Reports and distribute copies to Owner and Engineer on a weekly basis (Monday morning for previous week).
- B. Reports shall be prepared in type written format by Contractor's Field Engineer and include the following items as a minimum:
 - 1. Project Title.
 - 2. Contract Number.
 - 3. Date Report Represents.
 - 4. Date Report was prepared.
 - 5. Field Engineer's Name.
 - 6. Work start time and work stop time.
 - 7. Official weather report from the nearest Federal Weather Reporting Station, or as approved by Engineer.
 - 8. Manpower distribution and totals by category of trade and trade skill level.
 - 9. Contractor's project administration manpower by description and total.
 - 10. Summary of manpower tasks scheduled and accomplished during reporting period.
 - 11. Summary of materials and products delivered and quantities used during reporting period.
 - 12. Other information as required.

PROJECT MEETINGS

GLEN ARM SIGN AND SIGNAL SHOP – HVAC
SYSTEM REPLACEMENT
BALTIMORE COUNTY, MARYLAND
JOB ORDER NUMBER - 0001042031

PROJECT MANUAL
100% Construction Documents
1-17-2025

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PROJECT MEETINGS

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL PROCEDURES

A. Coordination:

1. Coordinate submittals with performance of construction activities.
2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
3. Prepare, review, approve, and transmit each submittal sufficiently in advance of performance of related construction activities to avoid delays.
4. Allow sufficient time (2 weeks) for Architect's and their consultant's review action. Large submittals and those with large quantities of products may require additional time.
5. Allow time for reprocessing each submittal.
6. No extension of Contract Time, or delay costs, will be due to:
 - a. Failure to prepare submittals sufficiently in advance of Work.
 - b. Lack of proper coordination between contactors or systems.
 - c. Inadequate or lack of documentation, requiring additional submittals or repeated reviews.

B. Submittal Preparation:

1. Each submittal shall have a label or title block for identification.
2. Indicate name of entity that prepared each submittal on label or title block.
3. Provide space on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
4. Include following information on label for processing and recording action taken.
 - a. Project name and number.
 - b. Date.
 - c. Name of Architect.
 - d. Name and address of Contractor.
 - e. Name of subcontractor.
 - f. Name of manufacturer.
 - g. Number and title of appropriate Specification Section.
 - h. Drawing number and detail references, as appropriate.

C. Contractor's Review and Approval:

1. Contractor shall review all submittals for compliance with Contract Documents and approve submittals prior to transmitting to Architect.
2. Specifically record deviations from Contract Document requirements, including minor variations and limitations.
3. Contractor's approval of submittals shall indicate that Contractor has determined and verified materials, field measurements and field construction criteria, and has checked and coordinated information contained within each submittal with requirements of work and Contract Documents.

SUBMITTAL PROCEDURES

D. Submittal Transmittal:

1. Every submittal shall include a transmittal to accompany the product data, etc.
2. Transmit each submittal with corresponding transmittal form.
3. On transmittal, record relevant information including deviations from Contract Document requirements, including minor variations and limitations.
4. Transmit submittals to Architect via electronic file unless otherwise noted or directed.
5. Where noted or directed, also transmit submittal electronic files to Architect's identified consultant(s). Architect shall be the primary recipient and shall always receive all transmittals, submittal files, etc.
6. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

E. Late Submittals and Failure to Submit:

1. It is the Contractor's responsibility to submit all required submittals and in a timely fashion. Information on specific products requiring submittals are provided within individual specification sections.
2. Failure to provide a required submittal does not relieve the contractor of compliance with the Contract Documents.
3. Late submittals for product which have been ordered in advance, or installed, shall be reviewed by the Architect as any other submittal. No special exceptions shall be granted. If Architect's review indicates a problem with the submitted product, the Contractor shall be fully responsible for remediation or correction to meet the specifications, including complete removal/replacement of non-compliant products, as applicable.

1.2 SHOP DRAWINGS

A. Shop Drawings: Newly prepared information drawn accurately to scale.

1. Shop Drawings shall include the project name, contractor(s), manufacturer, etc.
2. Highlight, encircle, or otherwise indicate in RED, so as to clearly and specifically call to the attention of the Architect all deviations from Contract Documents.
3. Do not reproduce Contract Documents or copy standard generic manufacturer's information as basis of Shop Drawings.
4. Standard information prepared without specific reference to Project will be rejected.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, Shop Drawings shall be in PDF format, on sheets at least 8-1/2" x 11", but no larger than 30" x 42", when printed at full size. All scaled drawings shall include a graphic scale.

SUBMITTAL PROCEDURES

1.3 PRODUCT DATA

- A. Product Data includes brochures, diagrams, standard schedules, performance charts, and instructions that illustrate physical size, appearance and other characteristics of materials and equipment.
- B. Organize Product Data into a single submittal for each element of construction or system.
 - 1. Highlight, encircle, use Arrows, or otherwise indicate in RED, so as to clearly and specifically indicate the applicable characteristics of the product or system.
 - 2. Where printed Product Data includes information on products that are not required or not applicable to this submittal, eliminate or mark through information that does not apply.
 - 3. Where Product Data indicates or includes available options, mark proposed options via encircling or highlighting those provided, and crossing out those not to be provided.
 - 4. Where selection of options, colors, or other features is required by Architect, Clearly indicate this need on the page where the option(s) apply, and on the submittal transmittal.

1.4 SAMPLES

- A. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, color/texture/pattern samples, or fully functional products (ie light fixtures).
- B. Samples shall require a physical delivery of the material to the Architect and/or sub-consultants. Additional time shall be anticipated in the Contractor's schedule due to delivery times, shipping or mailing delays, etc.
- C. Where Samples are submitted, the same procedure of electronic file transfer shall be used for the submittal transmittal form, etc., in addition to a copy of the same transmittal accompanying the physical delivery.
- D. Submit fully fabricated Samples cured and finished as specified and physically identical with material or product proposed.
 - 1. Mount or display Samples in manner to facilitate review of qualities indicated.
 - 2. Identify Samples with generic description, product name, and name of manufacturer.
 - 3. Submit Samples for review and verification of size, kind, color, pattern, and texture.
 - 4. Where variation in color, pattern, texture, or other characteristic is inherent in material or product represented, submit at least 3 multiple units that show approximate limits of variations.
 - 5. Submittals: Submit two (2) full identical sets of choices where Samples are submitted for Architect's selection of color, pattern, texture, or similar characteristics from a range of standard choices. Architect will return at least 1 set marked with action taken. One set shall be retained by the Architect.
 - 6. Maintain set(s) of approved Samples, as returned, at Project Site, for quality comparisons throughout course of construction

1.5 QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS

SUBMITTAL PROCEDURES

- A. Quality assurance and quality control submittals include design data, test reports, certifications, manufacturer's instructions, and manufacturer's field reports.
- B. Professional design services or certifications: Where Contract Documents require professional design services or certifications by a design professional, Contractor shall cause such services or certifications to be provided by a qualified design professional, whose registration seal shall appear on drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Architect shall be entitled to rely upon adequacy, accuracy, and completeness of services, certifications, or approvals performed by such design professionals.
- C. Inspection and Test Reports: Inspection and test Reports documenting testing and verification by independent testing agencies, government authorities, or inspection agencies, that installed products, systems or sequences meet specified performance and/or comply with specified or Code requirements.
- D. Manufacturer's instructions: Preprinted instructions concerning proper application or installation of system or product.
- E. Manufacturer's field reports: Reports documenting testing and verification by manufacturer's field representative, to verify compliance with manufacturer's standards or instructions, installed performance, etc.

1.6 ELECTRONIC SUBMITTAL PROCEDURES

- A. The contractor shall make all submissions of contractor qualifications, shop drawings, product data, Quality Assurance and Control submittals, test reports, and similar via electronic means, except for physical Samples.
- B. Electronic submittals shall contain all required information specified herein, submitted in PDF format. Each submittal shall be submitted as a separate PDF file, appropriately named according to the spec section number and product. Example: first product from the Fire Pump spec section would be identified as: 13920-01- FirePump.PDF."
- C. Single product or system submittals may contain separate PDF files for such items as Product Data, Factory drawings, etc. However, a single product submittal containing numerous PDF files, or *.zip files containing multiple PDF files, are not permitted.
- D. Resubmissions shall extend the original PDF file name with addition of "R#" following the spec section and project item number. Example; first resubmission of the fire pump would be identified as
13920-01R1 - FirePump-Revised.PDF."
- E. Electronic submittals shall be identified following the specified naming and organization per this section, and shall include the following:
 - 1. Submittal Transmittal including the project name/number, Client, Architect, and contents.
 - 2. Cover Sheet with contractor, subcontractor and/or manufacturer's information.
 - 3. Comparable Product Forms, when required.
 - 4. PDF files shall contain only materials related to the product being submitted for review.

SUBMITTAL PROCEDURES

5. All PDF files shall be clearly marked to indicate proposed material(s), ratings, sizes, and applicable options, accessories, etc.
 6. Do NOT submit a single transmittal which covers numerous separate products. Use separate transmittals for each submittal.
- F. The following submittal types and procedures are not acceptable. Such submittals shall be Rejected:
1. Links to manufacturer, contractor or vendor websites.
 2. Files containing executable files or content.
 3. Submittals requiring download or use of custom/proprietary software in order to access or display submittal materials or files.
 4. PDF files containing entire catalogs or other vast content, beyond that directly related to the product being submitted.
 5. Files in any format other than PDF.
- G. Where submittal file size may prevent email transmission, contractor shall contact the Architect, who will provide information and access information for use of Architect's FTP site.
- H. Architect's Action: As specified below, Architect shall take appropriate action for each submittal, and shall provide notification of review, comments, rejection, etc. via an electronic Shop Drawing Review Form, distributed via electronic means, to all parties, along with the original submittal PDF file(s).

1.7 ARCHITECT'S ACTION

- A. Architect will review and take appropriate action upon receipt of Contractor's submittals, but only for limited purpose of checking for conformance with information given and design intent expressed in Contract Documents.
1. Architect's action will be taken with reasonable promptness, while allowing sufficient time in Architect's professional judgment to permit adequate review.
 2. Review of submittals is not to determine accuracy or completeness of details, dimensions, and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain responsibility of Contractor.
 3. Review of submittals shall not constitute approval of safety precautions or any construction means, methods, techniques, sequences or procedures.
 4. Review and approval of specific items shall not indicate approval of assemblies of which item is a component.
 5. Review and approval of products shall not verify proper fit of the contractor's proposed products or materials in the space where installed. Contractor shall be fully responsible for verifying sufficient space for proposed products, precise location and coordination with adjacent construction and materials.
 6. Compliance with specified characteristics is Contractor's responsibility.
- B. Review Action Notation: Architect shall provide will mark appropriate notation on uniform action stamp, as follows:
1. "Approved" indicates work covered by submittal may proceed provided it complies with requirements of Contract Documents.
 2. "Approved, Comments Noted" indicates Work covered by submittal may proceed

SUBMITTAL PROCEDURES

provided it complies with notations or corrections on submittal and requirements of Contract Documents.

3. “Amend and Resubmit” or “Rejected” indicates that Work covered by submittal, including purchasing, fabrication, delivery, or other activity may not proceed. Revise or prepare new submittal according to notations; resubmit without delay. Repeat if necessary to obtain different action mark.

C. Informational Submittals: Submittals for information or record purposes, including Quality Assurance and Quality Control Submittals, will not require responsive action by Architect.

1. Architect will reject and return informational submittals not in compliance with Contract Documents.

D. Incomplete Submittals: Architect will return incomplete submittals without action.

E. Unsolicited Submittals: Architect will return unsolicited submittals to sender without action.

1.8 DISTRIBUTION

- A. Contractor shall furnish copies of final submittals to installers, subcontractors, suppliers, manufacturers, fabricators, and other parties, as required for coordination and performance of construction activities.
- B. Do not permit use of unmarked copies or rejected copies of submittals in connection with construction at project site or elsewhere where work is in progress.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 56 90

CONSTRUCTION CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cleaning and disposal of Contractor-generated construction waste materials, debris, and rubbish for duration of Contract.
- B. Cleaning and disposal of Contractor- and Owner-generated field office waste materials, debris and rubbish for duration of Contract.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Provide covered containers for deposit of waste materials, debris, and rubbish.

PART 3 - EXECUTION

3.1 CLEANING

- A. Maintain project limits free of waste materials, debris, and rubbish on a daily basis.
- B. Maintain project limits in a clean and orderly condition on a daily basis.
- C. Remove debris and rubbish from pipes, structures, and other closed or remote spaces, prior to closing the space and/or as instructed by the Owner or the Owner's Field Project Manager.
- D. Daily clean interior areas to provide suitable conditions for Work.
- E. Control cleaning operations so that dust and other particles will not adhere to wet or newly coated surfaces.
- F. Remove debris, trash and clean project limits and field offices at the direction of the Owner at no additional cost to the Owner within 24 hours of receiving written direction.

CONSTRUCTION CLEANING

3.2 DISPOSAL

- A. Remove waste materials, debris, and rubbish from site daily and legally dispose of off-site.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Product selection requirements.
 - 2. Product delivery, storage, and handling requirements.
 - 3. Standard and special warranties.
 - 4. Comparable products.
- B. Related Sections:
 - 1. Division 1 – Section 01 63 00 “Product Substitution Procedures”.
 - 2. Division 1 – Section 01 65 00 “Transportation and Handling”.
 - 3. Division 1 – Section 01 66 00 “Storage and Protection”.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term product includes the terms material, equipment, system, and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes proposed by Contractor in products, manufacturer's materials, equipment, and methods of construction required by the Contract Documents.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named, or a product is accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

PRODUCT REQUIREMENTS

- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Extended Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.3 SUBMITTALS

- A. Comply with Division 1- Section 01 33 00 "Submittal Procedures".
- B. Comparable Products Submission:
 - 1. Document each request for use of a proposed comparable product with supporting data substantiating compliance of proposed product with Basis-of-Design product.

1.4 QUALITY ASSURANCE

- A. Source Limitations: To fullest extent possible, provide products of the same kind from a single source.
- B. Compatibility of Options: When Contractor is given option of selecting between 2 or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on exterior.
- D. Required Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
- E. Electrical Equipment Standards:
 - 1. Comply with applicable electrical code requirements referenced in Division 16.
 - 2. Provide permanent nameplate on power-operated equipment; list manufacturer's name and other essential operating data.
 - 3. Provide materials, appliances, and other equipment tested and listed by Underwriters Laboratories, Inc. (UL). Evidence of listed products shall be UL label or other identification acceptable to authorities having jurisdiction.
 - 4. Where pre-assembled electrical components cannot be UL listed, provide inspection, testing and certification of compliance with applicable standards by an electrical inspection and testing agency acceptable to authorities having jurisdiction. Certification shall state that item has been tested in accordance with UL test methods and that item complies with applicable UL standards.

1.5 DELIVERY, STORAGE, AND HANDLING

PRODUCT REQUIREMENTS

- A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Schedule delivery to minimize long-term storage at Project Site and to prevent overcrowding of construction spaces.
- C. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- D. Deliver products to Project Site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- E. Inspect products upon delivery to ensure compliance with Contract Documents and to ensure that products are undamaged and properly protected.
- F. Store products in manner that will facilitate inspection and measurement.
- G. Store materials in a manner that will not endanger project structure.
- H. Store products subject to damage by elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation.
- I. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Extended Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to Divisions 2 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 – Section 01 77 00 "Contract Closeout Procedures".

PART 2 PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with Contract Documents that are undamaged and new at time of installation.

PRODUCT REQUIREMENTS

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Where products are accompanied by the term as selected, Engineer will make selection.
 4. Where products are accompanied by the term match sample, sample to be matched is Engineer's.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. General Compliance Requirements: Compliance requirements for individual products, as indicated in Contract Documents, are multiple in nature and may include generic descriptions, performance requirements, compliance with reference standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.
- C. Procedures for Selecting Products: Contractor's options for selecting products are limited by Contract Document requirements, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.
- D. Products specified by Reference Standards, Codes and Regulations: Select from among products, which can be shown to comply to referenced documents.
- E. Products specified by Naming Products and Manufacturers: Select from among products listed.
- F. Products specified by Naming One Manufacturer's Product as the Basis-of-Design with Reference to Other Manufacturers: Select either the specified Basis-of-Design product or a comparable product by one of the other named manufacturers.
1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named manufacturers.
- G. Products specified by Naming One Manufacturer's Product and Indicating Option of Selecting Comparable Products by stating "or Approved Equal" or similar language: Select either the specified product or a comparable product.
1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named or un-named manufacturers.
- H. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and, matches Engineer's sample. Engineer's decision will be final on whether proposed product matches satisfactorily.
- I. Visual Selection Specification: Where Specifications include the phrase as selected from manufacturer's standard colors, patterns, textures or similar phrase, select a product that complies with other specified requirements. Architect will select color, pattern, and texture.

PRODUCT REQUIREMENTS

1. Standard Range: Where Specifications include the phrase standard range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
2. Full Range: Where Specifications include the phrase full range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Where Basis-of-Design products are specified by name, submit the following, in addition to other required submittals, to obtain approval of a comparable product by one of the named manufacturers:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, which it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with the Basis-of-Design product in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, serviceability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 5. Samples, if requested.

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 63 00

PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes basic requirements and procedures for consideration of proposals for substitutions.

1.2 SUBSTITUTION REQUIREMENTS

- A. Engineer will consider requests for substitution if received within 14 days after Notice to Proceed.
 - 1. Requests received more than 14 days after Notice to Proceed may be considered or rejected at discretion of Engineer.
- B. Conditions required for substitution requests: Engineer will receive and consider Contractor's request for substitution under the following conditions:
 - 1. Request is fully documented, and properly submitted.
 - 2. Extensive revisions to Contract Documents are not required.
 - 3. Proposed changes are in keeping with general intent of Contract Documents.
 - 4. Requested substitution offers Owner an advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- C. Contractor's submittal and Engineer's acceptance of Shop Drawings, Product Data, or Samples not complying with Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval. Substitutions not properly authorized may be considered defective.

1.3 SUBMITTALS

- A. Comply with Division 1 - Section "Submittal Procedures".
- B. Substitution Request Submittal:
 - 1. Identify product to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 2. Provide complete documentation showing compliance with requirements for substitutions.
 - 3. Include coordination information necessary to accommodate proposed substitution.
 - 4. Include a detailed comparison of significant qualities of proposed substitution with those of product specified.
 - 5. Provide samples, where applicable or requested.

PRODUCT SUBSTITUTION PROCEDURES

6. Include cost information, including a proposal of net change, if any in Contract Sum.
 7. Include Contractor's certification.
- C. Contractor's Certification shall state the following:
1. Proposed substitute product has been fully investigated and determined to be equal or superior in all respects to specified product.
 2. Same warranty will be furnished for substitute product as for specified product.
 3. Cost data presented is complete and includes all related costs under this Contract except Engineer's redesign and reevaluation costs; Contractor's claims for additional costs related to the substitution which subsequently become apparent are waived.
 4. Proposed substitution will not affect dimensions, functional clearances, utility requirements, system operation and performance, and will be fully coordinated and complete in all respects.

1.4 ENGINEER'S ACTION

- A. Engineer will review and take appropriate action upon Contractor's request for substitutions.
1. Engineer's action will be taken with reasonable promptness, while allowing sufficient time in Engineer's professional judgment to permit adequate review.
 2. Engineer shall be entitled to rely upon adequacy, accuracy, and completeness of data, and certifications prepared by Contractor.
 3. If necessary, Engineer will request additional information or documentation for evaluation after initial review of receipt of request for substitution.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 63 00 SUBSTITUTION REQUEST FORM

To: _____ Project: _____

Section Paragraph Specified Item

Drawing No: _____

Proposed Substitute: _____

Attach complete description, catalog, spec data, laboratory tests if applicable, and side by side comparison chart of all features, characteristics, and performance criteria per requirements of Section 01600.

1. Will substitute affect dimensions indicated on Drawings? _____

2. Will substitute affect wiring, piping, ductwork, etc. indicated on the Drawings? _____

3. What effect will substitution have on other trades? _____

4. Difference between proposed substitute and specified item: _____

5. The undersigned agrees to pay for architectural and engineering costs if required to revise the Contract Drawings caused by this substitution.

6. Manufacturer's warranties of the specified items and proposed items are (select one):

Same _____ Different (Explain) _____

7. If the substitution is accepted, it will result in (select one):

No cost impact: _____ Credit (amount): _____

SUBSTITUTION REQUEST FORM

SUBMITTED BY:
COMMENTS

Firm: _____
noted

Address: _____

Signature: _____

Date: _____

ARCHITECT/ENGINEER'S REVIEW

_____ Accepted _____ Accepted as

_____ Not Accepted

Signature: _____

Date: _____

REMARKS: _____

END OF SECTION

SECTION 01 65 00

TRANSPORTATION AND HANDLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Packaging, Transportation.
- B. Delivery and Receiving.
- C. Product Handling.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PACKAGING AND TRANSPORTATION

- A. Require supplier to package finished products in boxes or crates for protection during shipment, handling, and storage.
- B. Protect sensitive products against exposure to elements and moisture.
- C. Protect sensitive equipment and finished against impact, abrasion, and other damage.

3.2 DELIVERY AND RECEIVING

- A. Arrange deliveries of products in accordance with construction progress schedules.
- B. Allow time for inspection prior to installation.
- C. Coordinate deliveries to avoid conflict with Work and conditions at site; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.
- D. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

TRANSPORTATION AND HANDLING

- E. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents, to permit easy accumulation of parts, and to facilitate assembly.
- F. Immediately upon delivery, inspect shipment to assure:
 - 1. Product complies with requirement of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.
 - 4. Containers and packages are intact and labels legible.
 - 5. Products are protected and undamaged.

3.3 PRODUCT HANDLING

- A. Provide equipment and personnel to handle products, by methods to prevent soiling and damage.
- B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.
- C. Handle product by methods to avoid bending or overstressing.
- D. Lift large and heavy components only at designated lift points.

END OF SECTION

SECTION 01 66 00
STORAGE AND PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Storage, General.
- B. Enclosed Storage.
- C. Exterior Storage.
- D. Maintenance of Storage.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

- A. Store products, immediately upon delivery, in accordance with manufacturer's instructions, with seals and labels intact.
- B. Protect until installed.
- C. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.
- D. Storage of materials to be used for a week's duration may be stored in the secured construction area.
- E. Stored materials must not conflict with work conditions.
- F. On-site storage subject to Owner approval and inspection.

3.2 ENCLOSED STORAGE

- A. Store products, subject to damage by the elements, in substantial weathertight enclosures.

STORAGE AND PROTECTION

- B. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
- C. Provide humidity control and ventilation for sensitive product, as required by manufacturer's instructions.
- D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3.3 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage.
- B. Protect products from soiling and staining.
- C. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material.
- D. Provide ventilation to avoid condensation.
- E. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
- F. Provide surface drainage to prevent erosion and ponding of water.
- G. Prevent mixing of refuse or chemically injurious materials or liquids.

3.4 MAINTENANCE OF STORAGE

- A. Periodically inspect stored products on a schedule basis.
- B. Maintain a log of inspections available to Owner on request.
- C. Verify that storage facilities comply with manufacturer's product storage requirements.
- D. Verify that manufacturer-required environmental conditions are maintained continually.
- E. Verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.

3.5 MAINTENANCE OF EQUIPMENT STORAGE

- A. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.
- B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a Record Document.

END OF SECTION

STORAGE AND PROTECTION

SECTION 01 73 10
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
 - 1. Demolition and removal of selected portions of a building structure's, mechanical and electrical systems, and underground utilities.

1.3 SUBMITTALS

- A. Cutting and Patching: Submit a proposal describing the procedures at least 10 days before time of planned work. Include the following information:
 - 1. Extent of cutting and patching, how it will be performed and why it cannot be avoided.
 - 2. Changes to in-place construction and anticipated results.
 - 3. Changes to structural elements and building's appearance.
 - 4. List products to be used and firms who will complete the work.
 - 5. Date and time of work.
 - 6. Utility interruptions required.
 - 7. Obtain approval of Architect and Owner prior to proceeding with any cutting and patching work.

1.4 QUALITY ASSURANCE

CUTTING AND PATCHING

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
 - 1. Structural engineering services to be provided by the general contractor as design/build. Modifications to structure are to be coordinated with architectural design intent.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended, or that will increase maintenance or decrease service life.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch items exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-place materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces and elements to the greatest extent possible.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
 - 3. Materials shall be approved by the Architect/Engineer.

PART 3 - EXECUTION

CUTTING AND PATCHING

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which the work is to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes and primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Supports: Provide temporary support of all items to be cut.
- B. Protection: protect all existing construction during cutting and patching to prevent damage. Provide protections from adverse weather conditions for portion of the project that might be exposed during the work.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with work at the earliest feasible time, and complete without delays.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding and similar operations, including excavation, using methods least likely to damage remaining construction. Comply with original installer's written recommendations, where required.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing. Retain paragraph and subparagraph below if required. Limit hours of interruption, if applicable.

CUTTING AND PATCHING

- D. Cleaning: Clean areas and spaces where cutting and patching are performed.
 Completely remove paint, mortar, oils and similar materials.

END OF SECTION

CUTTING AND PATCHING

SECTION 01 73 20
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from site with further disposition at Contractor's option.

1.3 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building structure's, mechanical and electrical systems, and underground utilities.
- B. Related Sections include the following:
 - 1. Division 1 – Section 01 01 00 "Summary of Work" for use of the premises and phasing requirements.
 - 2. Division 1 - Section 01 73 10 "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
 - 3. Division 15 - Section for demolishing, cutting, patching, or relocating mechanical items

SELECTIVE DEMOLITION

4. Division 16 - Sections for demolishing, cutting, patching, or relocating electrical items.

1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.5 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of temporary partitions and means of egress.
 - 5. Coordination with Owner for Owner's continuing use and occupancy of portions of the building.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Pre-demolition Conference: Conduct conference with OWNER at Project site to comply with requirements in Division 1 – Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area during various phases of demolition and construction. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.

- D. Storage or sale of removed items or materials on-site will not be permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 PROTECTION

- A. Protection of Existing Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to ensure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced as approved by the Owner at no additional cost. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required. The Contractor shall ensure that structural elements are not overloaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract.
- B. Use of Explosives: Use of explosives will not be permitted.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
 - 3. Materials shall be approved by the Architect/Engineer.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Engineer.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities. When conducting any Contract work, the Contractor shall be responsible for asbestos-containing material (ACM) disturbances on the other side of walls, floor slabs, or ceiling decks adjacent to the immediate workspace. Equipment (piping, ducting, conduit, etc.) manipulations in the workspace may cause disturbances in adjacent rooms or at floor levels above or below the work space. The Contractor shall anticipate such potential disturbances and investigate conditions in adjoining areas before work begins. Conduct abatement or take other precautions, as necessary, to avoid ACM disturbance in the workspace and in adjacent areas. If pre-work

SELECTIVE DEMOLITION

investigation identifies existing conditions requiring remediation, due to previous work by others, the disturbed materials shall be remediated to avoid further disturbance. If unforeseen conditions are observed, the Contractor shall contact the Project Manager for direction.

2. The Contractor shall determine whether Mercury switches are present within thermostats that are removed. If Mercury switches are present, the Mercury components must be properly disposed

3.2 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways and other adjacent occupied and used facilities.
 1. Erect temporary protection, such as fences and railings, where required by Owner.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of the building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Drop cloths, plastic, plywood, or other materials must be placed on floors to protect the finish and integrity of flooring materials.
 5. Cover and protect furniture, furnishings and equipment that have not been removed.

SELECTIVE DEMOLITION

- C. Temporary Partitions: Erect and maintain fire-retardant, dust-proof partitions to limit dust and dirt migration and to separate areas from fumes and noise. Provide temporary doors with locking devices in partitions.
 - 1. During demolition work, the doors to the room shall be sealed in an air-tight manner to eliminate dust and fumes from migrating to other building areas. Where access to the room must be maintained, the doorway shall be covered with overlapping full lengths of polyethylene (poly) sheeting. Each layer of poly sheeting shall be sealed at the top and one side of the doorway, and the separate layers shall be sealed on alternating sides of the doorway.
 - 2. When work is conducted in the hallways or common areas, the doors to nearby classrooms shall be closed and sealed to prevent dust migration. When ceiling tiles or sections are removed from common areas, all lockers, floors, opening to chases, and classroom door vents shall be covered with one layer of poly sheeting to prevent dust settling and migration.
- D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.3 POLLUTION CONTROLS

- A. Dust, Noise and Odor Control: The Contractor is responsible for controlling the levels of construction dust, noise, and odors in the building. Dust levels within the building must be maintained at acceptably low levels through a combination of vigilant cleaning methods and preventative engineering controls. If a conflict arises regarding acceptable levels of dust, noise, or odors, the Baltimore County Project Manager will determine what is acceptable and the control methods that will be employed.
 - 1. Dust Control: Work areas shall be ventilated during general construction to reduce airborne dust levels and prevent dust movement outside the work area. Fans or air filtration units shall be placed within the work areas that actively move air from within the work area to the exterior of the building. The purpose of work area ventilation is to establish a negative pressure system within the work area, such that airborne dust will not drift to other areas of the building; rather, airborne dust will be attracted to the fan unit and discharged outside the building. Dust reducing attachments shall be used on all electrical tools which cause dust. Dust and dirt control floor mats must be used at the exit of any work area which leads to the building. Workers must be instructed to thoroughly wipe the bottoms of shoes on the floor mat prior to exiting the work area. Use of the floor mats by all workers must be strictly enforced in order to minimize transport of work area dust and dirt throughout the building. Mats or other dust/dirt control mechanisms must be cleaned or replaced as frequently as necessary to maintain their efficacy. Wet mopping and/or sweeping with sweeping compound shall be conducted nightly for all corridor floors and work area floors. Should the Contractor fail to

SELECTIVE DEMOLITION

maintain or clean the work area, said work will be performed by others and charged to the Contractor.

- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of the building by chute, hoist or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.4 CONSTRUCTION

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by OWNER. Provide temporary services during interruptions to existing utilities, as acceptable to OWNER.
 - 1. Provide at least 2 weeks notice to OWNER if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - 1. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - 2. Cut off pipe or conduit in walls or partitions to be removed. Cap, valves, or plug and seal remaining portion of pipe or conduit after bypassing.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining

SELECTIVE DEMOLITION

- construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches.
 4. Dispose of demolished items and materials promptly.
 5. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

B. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by OWNER, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

D. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

E. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

F. Disposal of Demolished Materials

1. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
2. Burning: Do not burn demolished materials.
3. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 REPAIR/RESTORATION

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 1 – Section 01731 "Cutting and Patching."

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to the manufacturer's written instructions.

SELECTIVE DEMOLITION

- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Filling: Fill holes, open basements and other hazardous openings in accordance with Division 2 - Section 02300 "Earthwork".

3.7 DISPOSAL

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Burning of materials is prohibited.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 74 00

FINAL CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Final cleaning of project.
- B. Site debris not exposed to view.
- C. Perform Final Cleaning at Substantial Completion and Final Completion.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 DESCRIPTION

- A. Execute and complete cleaning prior to inspection date established for Substantial Completion.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Use materials that will not create hazards to health or property and that will not damage surfaces.
- B. Use only materials and methods recommended by manufacturer of material being cleaned.

PART 3 – EXECUTION

3.1 CLEANING

- A. In addition to removal of debris and cleaning specified in other Sections, clean interior and exterior exposed-to-view surfaces.
- B. Remove temporary protection and labels not required to remain.
- B. Clean finishes free of dust, stains, films, and other foreign substances.

FINAL CLEANING

- C. Clean transparent and glossy materials to a polished condition; remove foreign substances.
- D. Vacuum clean carpet, fabric, and similar soft surfaces.
- E. Clean and damp-mop resilient and hard-surfaced floors as specified, wax and polish if recommended by manufacturer.
- F. Remove waste, foreign matter, and debris from roofs, gutters, areaways, and drainage systems.
- G. Remove waste, debris, and surplus materials from site.
- H. Clean site; remove stains, spills, and foreign substances from paved areas and sweep clean.
- I. Rake clean other exterior surfaces.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
 - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
 - 7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
 - 8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
 - 9. Precast concrete panels: May be used for erosion control or landscape features.
 - 10. Asphalt paving: May be recycled into paving for project.
 - 11. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 12. Glass.
 - 13. Gypsum drywall and plaster.
 - 14. Plastic buckets.
 - 15. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 16. Asphalt roofing shingles.
 - 17. Paint.
 - 18. Plastic sheeting.
 - 19. Rigid foam insulation.
 - 20. Vinyl siding.
 - 21. Windows, doors, and door hardware.
 - 22. Plumbing fixtures.
 - 23. Mechanical and electrical equipment.
 - 24. Fluorescent lamps (light bulbs).

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

25. Acoustical ceiling tile and panels.

- F. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- G. Develop and follow a Waste Management Plan designed to implement these requirements.
- H. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.
- B. Section 01 31 00 – Project Management and Coordination: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to product substitutions.
- D. Section 01 63 00 - Substitution Procedures.
- E. Section 01 70 00 – Contract Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- F. Section 01 56 90 – Construction Cleaning: Cleaning of project site during construction.
- G. Section 01 74 00 – Final Cleaning: Cleaning of project site at completion of construction.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 – Submittal Procedures for submittal procedures.
- B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - 1. Submit to Architect for Owner's review and approval.
 - 2. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - 3. Describe as many alternatives to landfilling as possible:
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the proposed local market for each material.
 - c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
 - 4. Provide alternatives to landfilling for at least the following materials:
 - a. Aluminum and plastic beverage containers.
 - b. Corrugated cardboard.
 - c. Wood pallets.
 - d. Clean dimensional wood.
 - e. Concrete.
 - f. Bricks.
 - g. Concrete masonry units.
 - h. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - i. Glass.
 - j. Gypsum drywall and plaster.
 - k. Plastic buckets.
 - l. Plastic sheeting.
 - m. Rigid foam insulation.
 - n. Mechanical and electrical equipment.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- o. Acoustical ceiling tile and panels.
 - C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.
 - D. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 5. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 - 5. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 31 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 56 90 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 65 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 66 00 for waste prevention requirements related to delivery, storage, and handling.
- E. See Section 01 73 10 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- F. See Section 01 73 20 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
 - 2. Provide containers as required.
 - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 5. Locate enclosures out of the way of construction traffic.
 - 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 - 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- E. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- F. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Administrative provisions for Substantial Completion and for Final Acceptance.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 SUBSTANTIAL COMPLETION

- A. Date of Substantial Completion: Contract duration minus 30 calendar days.
- B. When Contractor considers Work is substantially complete, submit written "Notice of Substantial Completion" to Owner and Engineer fourteen (14) days prior to last day of Contract Duration.
- C. Submit with the "Notice of Substantial Completion" a tabulated list of all Work items that are incomplete, require correction or adjustment.
 - 1. Number and identify work items by Item Number, specification Section Number and Description.
 - 2. Include space per item for Contractor's Project Manager, Owner's Field Project Manager and Architect/Engineer initials. Each will initial the Work when complete.
- D. Owner and Architect/Engineer will observe the work on date established for Substantial Completion in presence of Contractor and determine if work is substantially complete.
- E. If Owner or Architect/Engineer determines work is not substantially complete, Contractor shall be promptly notified in writing.
- F. Post Substantial Completion Inspection:
 - 1. Complete Work, remedy deficiencies and send a second written notice of Substantial Completion to Owner and Engineer labeled "Second Notice of Substantial Completion".
 - 2. The cost associated with a second Substantial Completion Inspection, and subsequent inspections, shall be deducted from Contract Sum at established labor rates of the Architect/Engineer, inclusive of all travel and related other direct costs and expenses.

CONTRACT CLOSEOUT PROCEDURES

3. Architect/Engineer will prepare a Certificate of Substantial Completion in compliance with provisions of General Conditions of the Contract when Work is determined to be substantially complete.

1.5 FINAL COMPLETION

A. Final Completion Date:

1. Five (5) days prior to last day of Contract Duration.
2. When Contractor considers Work is complete, submit written certification to Owner and Engineer 12 days prior to last day of Contract Duration titled "Notice - Certification of Final Completion".
3. The Notice - Certification of Final Completion shall include certification of the following:
 - a. Contract Documents have been reviewed.
 - b. Work has been inspected for compliance with Contract Documents.
 - c. Work has been completed in compliance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - 1) Submit in triplicate, a copy of outstanding Work items list, complete with Contractor, Owner and Architect/Engineer's initials signifying Work is complete.
 - d. Equipment and systems have been tested, adjusted, and balanced, and are fully operational.
 - e. Operation of systems has been demonstrated to Owner's personnel and professionally filmed.
 - f. Project record documents have been submitted to and approved by Owner.

B. Final Completion Inspection:

1. Work is complete and ready for final inspection by Owner and Engineer on date established for Final Completion.
2. Should Owner or Engineer inspection find Work incomplete, the Contractor will be promptly notified in writing.

C. Post Final Completion Inspection:

1. Remedy deficiencies and send a second Certification of Final Completion to Owner and Engineer titled "Second Notice - Certification of Final Completion".
2. Cost associated with a second Final Completion Inspection, and subsequent inspections, shall be deducted from Contract Sum at established labor rates of Architect/Engineer, inclusive of all travel and related other direct costs and expenses.
3. Architect/Engineer will prepare a Certificate of Final Completion in compliance with provisions of the General Conditions of the Contract when Work is determined to be complete.
4. When Owner and Architect/Engineer determine the Work is complete, submit Closeout Submittals.

1.6 CLOSEOUT SUBMITTALS

CONTRACT CLOSEOUT PROCEDURES

A. Evidence of Compliance with Requirements of Governing Authorities:

1. Certificates of Inspection required for mechanical, electrical, and special systems.
2. Record Documents are complete and submitted to Engineer.
3. Operation and Maintenance Manuals are complete, reviewed, approved and submitted to Owner in accordance with Division 1 - Section 01 78 30 "Operation and Maintenance Data".
4. Warranties and Bonds are complete, reviewed, approved and submitted to Owner in accordance with Division 1 - Section 01 78 50 "Warranties and Bonds".
5. Keys and Keying Schedule are complete, reviewed, approved and submitted to Owner.
6. Evidence of Payment and Release of Liens are complete, reviewed, approved and submitted to Owner in accordance with General Conditions of the Contract.
7. Consent of Surety to Final Payment.
8. Certificates of Insurance for Products and Completed Operations in accordance with Supplementary Conditions.

1.7 STATEMENT OF ADJUSTMENT OF ACCOUNTS

A. Submit final statement reflecting adjustments to Contract Sum indicating:

1. Original Contract Sum.
2. Previous change orders.
3. Changes under allowances.
4. Penalties and bonuses.
9. Other adjustments to Contract Sum.
9. Total Contract Sum as adjusted.
11. Previous payments.
12. Sum remaining due.

1.8 APPLICATION FOR FINAL PAYMENT

- A. Submit application for Final Payment in accordance with provisions of Conditions of the Contract after the Contractor has complied with Article "Closeout Submittals" of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

CONTRACT CLOSEOUT PROCEDURES

SECTION 01 78 10

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Maintenance of Record Documents and Samples.
- B. Submittal of Record Documents and Samples.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. See individual specification Sections for requirements of manufacturer's certificates and certificates of inspection.
- B. In addition to requirements in General Conditions, maintain at the site one record copy of each of the following:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Clarifications, Minor Modifications and Supplements.
 - 5. Change Orders and other modifications to the Contract.
 - 6. Reviewed shop drawings, product data, and samples.
 - 7. Field test records.
 - 8. Inspection certificates.
 - 9. Manufacturer's certificates.
- C. Store Record Documents and samples in Contractor's Site Office separate from documents used for construction.
- D. Provide files, racks, and secure storage for Record Documents and samples.
- E. Label and file Record Documents and samples in accordance with Section number listings in Table of Contents of this Project Manual.
- F. Label each document "PROJECT RECORD DOCUMENTS" in neat, large, printed letters.
- G. Maintain Record Documents in a clean, dry, and legible condition.

PROJECT RECORD DOCUMENTS

- H. Do not use Record Documents for construction purposes.
- I. Keep Record Documents and samples available for inspection by Owner, Architect and Engineer at all times.

1.5 RECORDING

- A. Record information on a set of “red line” set of As-Built drawings.
- B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.
- C. Record information concurrently with construction progress.
- D. Do not conceal any Work until required information is recorded.
- E. Contract Drawings and Shop Drawings:
 - 1. Legibly mark each item to record actual construction, including:
 - a. Measured depths of elements of foundation in relation to finish first floor datum.
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - d. Field changes of dimension and detail.
 - e. Changes made by Clarifications, Minor Modifications and Supplements.
 - f. Details not on original Contract Drawings.
 - g. References to related shop drawings and modifications.
 - 2. Specifications:
 - a. Legibly mark each item to record actual construction, including:
 - 1) Manufacturer, trade name, and catalog number of each product actually installed particularly optional items and substitute items.
 - b. Changes made by Addenda and modifications.
 - 3. Other Documents:
 - a. Maintain manufacturer's certifications, inspection certifications, and field test records, as required by individual Specification Section.

1.6 SUBMITTALS

- A. On the day established for Contract closeout, deliver Final Record Documents and Samples under provisions of Division 1 - Section 01 77 00 “Contract Closeout Procedures”.

1.7 FINAL RECORD DOCUMENTS

- A. Label each drawing above the title block – FINAL RECORD DOCUMENTS.

- B. Submit Project Record Documents and FINAL RECORD DOCUMENTS in PDF format with bookmarks for each section/item to Engineer and Owner for review as specified in Division 1 – 01 33 00 “Submittal Procedures”.
- C. Submit documents under cover letter, listing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's and subcontractor's name, address, and telephone number.
 - 4. Number and title of each Project Record Document and FINAL RECORD DOCUMENT.
 - 5. Signature of Contractor or authorized representative.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 30

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Format and content of Operation and Maintenance manuals.
- B. Instruction of Owner's personnel.
- C. Schedule of submittals.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.5 MANUAL FORMAT

- A. Prepare data in the form of an instructional manual.
- B. Binders: Commercial quality, 8-1/2-inch by 11-inch, white, three-ring "D" type ring binders with hardback, cleanable, plastic covers; 3-inch maximum ring size.
 - 1. When multiple binders are used, correlate data into related consistent groupings and provide table of contents in each binder.
- C. Covers: Identify each binder with typed or machine printed title "Operation and Maintenance Instructions."
 - 1. List title of Project, project number, substantial completion date, and identify subject matter of contents.
- D. Arrange content under specification Section numbers and sequence of Table of Contents of this Project Manual.
- E. Insert Table of Contents into each binder utilizing Avery Super Heavyweight 5.0.mills Sheet Protector No. PVH119-25 55015.
- F. Provide tabbed fly-sheet for each separate product and system, with typed description of product and major component parts of equipment.

OPERATION AND MAINTENANCE DATA

- G. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.
- H. Drawings: Provide with reinforced punched binder tab.
 - 1. Bind with text; fold larger drawings to size of text pages and insert each drawing into a separate 3-ring Avery Super Heavyweight 5.0 mils Sheet Protector No. PVH119-25 55015.

1.6 CONTENTS OF EACH VOLUME

- A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.
 - 1. List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts for each product or system.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, and to show control and flow diagrams.
 - 1. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data.
 - 1. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.7 MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for reordering custom manufactured products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture-Protection and Weather-Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual Specifications Sections.
- E. Provide a listing in Table of Contents for design data, with tabbed fly-sheet and space for insertion of data.

1.8 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System:

OPERATION AND MAINTENANCE DATA

1. Include description of unit or system, and component parts.
 2. Give function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
- C. Include as-installed, color-coded wiring diagrams.
- D. Operating Procedures: Include the following:
1. Start-up, break-in, and routine normal operating instructions and sequences.
 2. Regulation, control, stopping, shut-down, and emergency instructions.
 3. Summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Provide Contractor's coordination drawings, with as-installed, color-coded piping diagrams.
- I. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- J. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- K. Include test and balancing reports as specified in Division 1 - Section 01810 "Testing, Adjusting and Balancing of Systems".
- L. Additional Requirements: As specified in individual Specifications Sections.
- M. Provide a listing in Table of Contents of design data, with tabbed fly-sheet and space for insertion of data.

1.9 SUBMITTALS

- A. Submit to Engineer one copy of preliminary draft of proposed format and outline of contents at mid point of construction, but not less than 120 calendar days prior to date established for Substantial Completion.
1. Copy will be returned with Architect/Engineer comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

OPERATION AND MAINTENANCE DATA

- C. Submit one copy of completed volumes in final form 15 days prior to Substantial Completion.
- D. Copy will be returned following Substantial Completion, with Architect/Engineer comments.
- E. Revise content of documents as required prior to Final Record Documents submittal.
- F. Submit three (3) originals of revised volumes of data in final form at time designated for submittal of Final Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 50

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submittal of warranties and bonds.
- B. Schedule of submittals.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

- A. Division 1 Specification Sections.

1.4 FORM OF SUBMITTALS

- A. Bind in commercial quality 8-1/2-inch by 11-inch, three-ring "D" type ring binders, with hardback, cleanable plastic covers; 3-inch maximum ring size.
- B. When multiple binders are used, correlate data into related consistent groupings and provide table of contents in each binder.
- C. Label cover of each binder with typed or machine printed title "Warranties and Bonds," with title of Project, Project number, name, address, and telephone number of Contractor; and name of responsible principal.
- D. Table of Contents: Neatly typed, in sequence of Table of Contents of Project Manual; with each item identified with number and title of Specification Section in which specified, and name of Product or Work item. Insert Table of Content pages into Avery 5.0 mil Super Heavyweight Document Protector No. PVH119-25 55015.
- E. Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- F. Provide full information, using separate typed sheets as necessary.
- G. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.5 PREPARATION OF SUBMITTALS

- A. General: Verify with other Sections for required warranties.

WARRANTIES AND BONDS

- B. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of Work.
- C. Except for items placed into service with Owner's permission, leave date for beginning of warranty time blank until date of Substantial Completion is acceptable to the Owner and Architect/Engineer.
- D. Verify that documents are in proper form, contain full information, and are notarized.
- E. Co-execute submittals, when required.
- H. Provide originals.
- I. Photocopies are not acceptable.
- H. Retain warranties and bonds until time specified for Final Record Documents submittal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

WARRANTIES AND BONDS

**SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other sections of Division 23.

1.2 SUMMARY

- A. Section includes:
1. General administrative and procedural requirements, as well as the following basic mechanical materials and methods.
 2. Submittals.
 3. Record documents.
 4. Operation and Maintenance manuals.
 5. Rough-ins.
 6. Mechanical installations.
 7. Cutting and patching.
 8. Concrete equipment base construction requirements.
 9. Equipment nameplate data requirement.
 10. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section: "Identification for HVAC Piping and Equipment."
 11. Non-shrink grout for equipment installations.
 12. Field-fabricated metal and wood equipment supports.
 13. Installation requirements common to equipment specification Sections.
 14. Mechanical demolition.
 15. Touchup painting and finishing.

1.3 ACRONYMS

- A. The following list of abbreviations are utilized within the specifications and are provided as a reference:
1. AABC - Associated Air Balance Council
 2. ADA - American Disability Act
 3. ADC - Air Diffusion Council
 4. AGA - American Gas Association
 5. AMCA - Air Moving and Conditioning Association
 6. ANSI - American National Standards Institute
 7. ARI - Air Conditioning and Refrigeration Institute
 8. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers

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9.	ASME	-	American Society of Mechanical Engineers
10.	ASTM	-	American Society for Testing and Materials
11.	AWWA	-	American Water Works Association
12.	IBC	-	International Building Code
13.	CS	-	Commercial Standard
14.	IEEE	-	Institute of Electrical and Electronics Engineers
15.	IMC	-	International Mechanical Code
16.	IPC	-	International Plumbing Code
17.	MOSHA	-	-Maryland Occupational Safety and Health Administration
18.	MSSP	-	Manufacturers Standards Society of the Valve and Fittings Industry
19.	NEC	-	National Electrical Code
20.	NEMA	-	National Electrical Manufacturers Association
21.	NFPA	-	National Fire Protection Association
22.	OSHA	-	Occupational Safety and Health Administration
23.	SMACNA	-	Sheet Metal and Air Conditioning Contractors National Association
24.	TEMA	-	Tubular Exchanger Manufacturers Association
25.	UL	-	Underwriters' Laboratories

1.4 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term product includes the terms material, equipment, system, and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes proposed by Contractor in products, materials, equipment, and methods of construction required by the Contract Documents.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named, or a product is accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

- E. Extended Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.5 SYSTEM DESCRIPTION

- A. Design Requirements: Contract drawings are generally diagrammatic and do not indicate all offsets, fittings, transitions, access panels and other specialties required.
 - 1. Furnish and install all items as may be required at no additional cost to fit the work to the conditions encountered.
 - 2. Arrange piping, ductwork, equipment and other work generally as shown on the contract drawings, providing proper clearances and access.
 - 3. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawing submittal for approval in accordance with Submittals specified below.
 - 4. Subject to the provisions of Division 01, Architect may make reasonable changes in location of equipment piping and ductwork up to the time of rough-in or fabrication.

1.6 SUBMITTALS

- A. Comply with Division 01 Section: "Submittal Procedures".
- B. Shop Drawings and Product Data:
 - 1. Clearly identify all submittals:
 - a. Indicate intended application, location, etc.
 - b. Each submittal shall indicate the associated specification section, and paragraphs. Do not combine product data and shop drawing submittals from different spec sections into a single submittal package, even though they may be the same distributor, vendor or part of a single material order.
 - c. Clearly indicate the exact type, model number, size and special features of the proposed item.
 - d. Include catalog spec sheets to completely describe proposed equipment.
 - e. Factory order forms only showing the required capacities are not acceptable.
 - f. Identify all options furnished to meet specifications.
 - g. The Architect shall not select equipment ratings and/or options. Submittals not properly marked shall be returned without review.
- C. Product Substitutions: Comply with requirements of Division 01.
- D. Comparable Products Submission:
 - 1. Document each request for a proposed comparable product with supporting data substantiating compliance of proposed product with Basis-of-Design product.
 - 2. Use the attached "Comparable Product Submittal Form" in addition to the requirements specified herein.

3. Comparable products will not be reviewed without completion of the attached form.

E. Closeout Submittals:

1. Record Drawings: Prepare record documents in accordance with the requirements in Division 01 Section: "Execution and Closeout Requirements". In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - a. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - b. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Refer to Division 23 Section: "Identification for HVAC Piping and Equipment." Indicate actual inverts and horizontal locations of underground piping.
 - c. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - d. Approved substitutions, Contract Modifications, Responses to Contractor's Request for Information, and actual equipment and materials installed.
 - e. Record the locations and invert elevations of underground installations.
2. Operation and Maintenance Data: Prepare operation and maintenance data in accordance with Division 01 Section: "Execution and Closeout Requirements." In addition to the requirements specified in Division 01, include the following information for equipment items:
 - a. List of systems and equipment requiring service manuals.
 - b. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - c. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - d. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - e. Servicing instructions and lubrication charts and schedules.
 - f. Systems and Equipment test reports.

F. Products and Materials:

1. Submit complete descriptive data for all materials as follows:
 - a. Material specifications.
 - b. Data sheets.
 - c. Samples.
 - d. Capacity ratings.
 - e. Performance curves.
 - f. Operating characteristics.
 - g. Catalog cuts.

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- h. Dimensional drawings.
 - i. Wiring diagrams.
 - j. Installation instruction.
 - k. Any other information necessary to indicate compliance with contract documents.
 - 2. Edit submittal data specifically for application to this project.
 - 3. Submit actual operating conditions and characteristics for all equipment.
 - 4. Catalogs or catalog cuts are not acceptable unless the particular item and all relative data has been marked in such a manner as to be clearly defined.
 - 5. No mechanical item shall be fabricated, purchased, delivered to the site or installed, until reviewed by the Architect.
 - a. After the proposed materials have been approved, no substitution will be permitted except where approved by the Architect.
 - 6. Provide shop drawing and product data submittals as indicated under individual specification sections.
 - 7. Provide any other equipment requested by the Architect.
- G. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.7 QUALITY ASSURANCE

- A. Underwriter's Laboratory (UL) Requirements: All equipment containing electrical components and provided under Division 23 shall bear the Underwriter's Laboratory (UL) label, as a complete packaged system.
- 1. Equipment not provided with a UL label shall be tested in the field, certified and provided with a listed label at the installer's expense.
 - a. Field testing shall be performed by a testing agency approved by the authority having jurisdiction.
 - b. Provide services of a UL recognized, independent Electrical Testing Laboratory (ETL) to provide field inspection and testing. Provide and ETL Label on all such equipment.
- B. Fire Safe Materials: Unless otherwise indicated, materials shall conform to UL, National Fire Protection Agency (NFPA) or American Society for Testing and Materials (ASTM) standards for fire safety with smoke and fire hazard rating not exceeding flame spread of 25 and smoke developed of 50.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Division 01 Section: "Product Requirements": Product storage and handling requirements.
- 1. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

2. Schedule delivery to minimize long-term storage at Project Site and to prevent overcrowding of construction spaces.
3. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
4. Deliver products to Project Site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
5. Inspect products upon delivery to ensure compliance with Contract Documents and to ensure that products are undamaged and properly protected.
6. Store products in manner that will facilitate inspection and measurement.
7. Store materials in a manner that will not endanger project structure.
8. Store products subject to damage by elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation.
9. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.

1.9 PROJECT CONDITIONS

- A. Existing Conditions: Prior to preparing the bid, visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and all other matters, which can affect the work. No additional compensation will be made for failure to determine the conditions under which the work will be performed.
- B. Outages
 1. All mechanical outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon with the Owner.
 2. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled with the Owner at least fourteen days (14) days in advance. All such outages shall be performed on other than normal work hours, Monday through Friday 8 a.m. to 5 p.m.
 3. The bid price shall include the cost of all premium time required for outages and other work which interferes with the normal use of the building.
 4. The operation of valves or switches required to achieve an outage shall be accomplished by the Owner or the Contractor. Unauthorized operation of valves, power switches, or other control devices shall not be permitted.

1.10 SEQUENCING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

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- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- E. Coordinate connection of electrical services.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.
- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

1.11 PRODUCT WARRANTIES

- A. Division 01 Section: "Warranties and Bonds": Product warranties and product bonds.
- B. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- C. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include project-specific information and properly executed.
 - 2. Refer to Divisions 01 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Submittal Time: Comply with requirements in Division 01 Section: "Submittal Procedures".

1.12 DISCREPANCIES

- A. Where discrepancies occur between the drawings and specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the contract price. The Architect shall decide on the item and manner in which the work shall be provided, based on the design intent of the documents.

1.13 PRE-SUBMITTAL MEETINGS

- A. The Equipment Representative and/or the Mechanical Contractor shall be responsible for e-mailing, a minimum of 48 hours in advance, a copy of the Preliminary Submittal to all named

parties. The purpose of the meeting is to coordinate requirements and gain a full understanding from all parties as to what is required for a fully turnkey installation, as well as to minimize potential rejection of shop drawings. The Mechanical Contractor shall coordinate these meetings and shall document and publish minutes of all meetings.”

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with Contract Documents that are undamaged and new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.
 - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Where products are accompanied by the term as selected, Architect will make selection.
 - 4. Where products are accompanied by the term match sample, sample to be matched is Architect's.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. General Compliance Requirements: Compliance requirements for individual products, as indicated in Contract Documents, are multiple in nature and may include generic descriptions, performance requirements, compliance with reference standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.
- C. Procedures for Selecting Products: Contractor's options for selecting products are limited by Contract Document requirements and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.
- D. Products specified by Reference Standards, Codes and Regulations: Select from among products, which can be shown to comply with referenced documents.
- E. Products specified by Naming Products and Manufacturers: Select from among products listed.
- F. Products specified by Naming One Manufacturer's Product as the Basis-of-Design with Reference to Other Manufacturers: Select either the specified Basis-of-Design product or an approved comparable product by one of the other named manufacturers.
 - 1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named manufacturers.
- G. Products specified by Naming One Manufacturer's Product and Indicating Option of Selecting Comparable Products by stating or Approved Equivalent or similar language: Select either the specified product or an approved comparable product.

1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named or un-named manufacturers.
- H. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and, matches Architect's sample. Architect's decision will be final on whether proposed product matches satisfactorily.
- I. Visual Selection Specification: Where Specifications include the phrase as selected from manufacturer's standard colors, patterns, textures or similar phrase, select a product that complies with other specified requirements. Architect will select color, pattern, and texture.
 1. Standard Range: Where Specifications include the phrase standard range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 2. Full Range: Where Specifications include the phrase full range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Where Basis-of-Design products are specified by name, submit the following, in addition to other required submittals, to obtain approval of a comparable product by one of the named manufacturers:
 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work. Use the attached Comparable Products Submittal Form in addition to requirements listed herein.
 2. Detailed comparison of significant qualities of proposed product with the Basis-of-Design product in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, serviceability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Interface With Site Utility Companies:
 1. Provide all construction schedules, dates of requested services, outage windows, equipment locations, etc. necessary for utility work.

3.2 INSTALLATION

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where systems, materials and equipment are intended for overhead installation, and where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
 9. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
 10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- B. Rough-In
1. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
 2. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.
- C. Housekeeping and Equipment Pads
1. Construct pads of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete and reinforcement bars."
- D. Erection of Metal Supports and Anchorage
1. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
 2. Field Welding: Comply with AWS D1.1, "Structural Welding Code -Steel", "latest edition".

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section: "Execution and Closeout Requirements". In addition to the requirements specified in Division 01, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, ductwork, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Patch finished surfaces and building components using new materials specified for the original installation and using experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

3.4 MECHANICAL DEMOLITION

- A. Disconnect, demolish, and remove work specified under Division 23 and as indicated. Remove pipes and ducts back to the active pipe and duct to remain and cap.
- B. Where pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Abandoned Work: Cut and remove buried pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from the Project site.

- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.5 PENETRATION OF WATERPROOF CONSTRUCTION

- A. Coordinate the work to minimize penetration of waterproof construction, including roofs, exterior walls and interior waterproof construction.
- B. Furnish and install drains, curbs, vent assemblies, sleeves, flashing, etc. specifically designed for application to the particular construction. Install system in accordance with the roofing manufacturer's instructions.

3.6 CLEANING

- A. Clean surfaces prior to application of insulation, adhesives, coating, and paint.
- B. Provide factory applied finish where specified.
- C. Protect all finishes, and restore all finishes to their original condition if damaged as a result of work under Division 23.
- D. Remove all construction marking and writing from exposed equipment, ductwork, piping and building surfaces.
- E. General: General cleaning during construction is required by the General Conditions and included in Section Temporary Facilities.
- F. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- G. Remove all mechanical clipping, wiring, nuts, bolts, etc. left on top of ceilings and ceiling tiles.

3.7 PROTECTION

- A. Protect work, material and equipment from weather and construction operations before and after installation.
- B. Properly store and handle all materials and equipment.
- C. Cover temporary openings in piping, ductwork and equipment to prevent the entrance of water, dirt, debris, and other foreign matter.

3.8 LUBRICATION

- A. All bearings, motors and all equipment requiring lubrication shall be provided with accessible fittings.
- B. Before turning over the equipment to the Owner, provide the following:
 - 1. Fully lubricate each item of equipment.
 - 2. Provide 1 year's supply of lubricant for each type of lubricant.
 - 3. Provide complete written lubricating instructions, together with diagram locating the points requiring lubrication.
- C. Motors and equipment shall be provided with grease lubricated roller or ball bearings with Alemite or equal extended grease fittings and drain plugs.

3.9 ELECTRICAL WORK

- A. It is the intent to provide a complete and operational system. The work between Division 23 and 26 is complementary and is meant to produce a single and operating system. Contractor shall make its own determination as to the distribution of responsibility among the various trades.
- B. All electrical work performed under Division 23 shall be provided in accordance with Division 26.

3.10 OPERATION OF EQUIPMENT

- A. Clean all systems and equipment prior to initial operation for testing and balancing.
- B. Do not operate equipment unless all proper safety devices or controls are operational.
- C. Provide all maintenance and service for equipment, which is operated during construction.
- D. Where specified and otherwise required, provide the services of a manufacturer's factory trained service organization to start the equipment.
- E. Do not use mechanical systems for temporary services during construction unless authorized in writing by the Architect.
 - 1. Where such authorization is granted, temporary use of equipment shall not limit or otherwise affect warranties or guarantees of the work.
- F. Upon completion of work, clean and restore all equipment to new conditions and replace all filters.

3.11 DEMONSTRATION

- A. Demonstrate operation and maintenance of equipment and systems to Owner's personnel a minimum two (2) weeks prior to date of final inspection.

1. For equipment requiring seasonal operation, perform instructions for other seasons at the same time.
 2. Training period shall be performed within 1 – one day period.
- B. Use operation and maintenance manuals and video as basis of instruction. Review contents of manual and video with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate the following:
1. Start up.
 2. Operation.
 3. Control.
 4. Adjustment.
 5. Trouble shooting.
 6. Servicing.
 7. Maintenance.
 8. Shutdown.
- D. Provide at least 8 hours straight time instruction to the operating personnel.
1. This instruction period shall consist of not less than five-8 hour days.
 2. Time of instruction shall be designated by the Owner.
 3. This instruction shall be in addition to instructional requirements of specific equipment specified elsewhere in Division 23.

3.12 WALL AND FLOOR PENETRATION

- A. All penetrations of partitions, walls and floors by ducts, piping or conduit under Division 23 shall be sealed and caulked. Provide U.L. listed fire stopping systems at penetrations through fire rated walls.

3.13 PROJECT PUNCH OUT

- A. Architect/Engineer will perform punch out reviews and will provide the Contractor with a list of punch list items to be completed before contract close out. Each and every punch list item shall be initialed and dated by the Contractor when the work is complete. The Architect/ Engineer will not perform any punch list verification until all items have been completed, initialed, dated and the list returned to the Architect/Engineer.

COMPARABLE PRODUCT SUBMITTAL FORM

Table of Compliance (Sample)

Shop Drawing and Product Data Submittal

The Contractor shall prepare a Table of Compliance Form similar in format to the sample shown below to facilitate and expedite the Shop Drawing and Product Data Review. Failure to comply with this requirement will be basis for rejecting the Submittal.

The Table of Compliance Form will list and compare the performance parameters as the submitted equipment to that listed on equipment schedule and specifications as basis of design. All non-compliance items (differences) must be explained in full, indicating their impact, if any, on maintainability, durability, energy use, operating costs, code compliance and environmental considerations.

(Sample)

TABLE OF COMPLIANCE

EQUIPMENT: _____

SPEC. SECTION: _____

BASIS OF DESIGN	DRAWINGS	SUBMITTED	EXPLANATION
SAMPLE ITEMS			
Flow (Cfm Or Gpm)			
Ext. Static Press.			
Electrical Requirements			
Cooling Capacity			
Heating Capacity			
Filter Type & Eff.			
Equipment Eff. (Eer)			
Sound Data			
Weights			
Etc.			
Specifications:			
Quality assurance compliance (ARI)			
(ASHRAE)			
(AMCA)			
(UL)			
Specifications: List each and every specification paragraph			
Other:			

COMMON WORK RESULTS FOR HVAC

GLEN ARM SIGN AND SIGNAL SHOP – HVAC
SYSTEM REPLACEMENT
BALTIMORE COUNTY, MARYLAND
JOB ORDER NUMBER - 0001042031

PROJECT MANUAL
100% Construction Documents
1-17-25

END OF SECTION

COMMON WORK RESULTS FOR HVAC

23 05 00 -16

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and the other Sections of Division 23.

1.2 SUMMARY

- A. General Requirements
1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular product components, parts, and assemblies.
 2. Comply with maximum load ratings with considering for allowable stresses prescribed by ASME B31.1 or MS SP-58.
 3. Provide support, guides and anchors that do not transmit unacceptable heat and vibration to building structure.
 4. Installation of pipe hangers and supports shall be based upon the overall design concept of the piping system. The support system shall provide for and control the free movement of piping including its movement in relation to the connected equipment.
 5. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.
- B. Section Includes:
1. Pipe hangers and supports.
 2. Hanger rods.
 3. Inserts.
 4. Flashing.
 5. Sleeves.
 6. Firestopping relating to HVAC work.
 7. Firestopping accessories.
 8. Equipment bases and supports.
 9. Acoustical Sealant.
- C. Related Sections: The following sections contain requirements that relate to this Section:
1. Division 23 Section: "Common Work Results for HVAC."
 2. Division 23 Section: "HVAC Insulation."
 3. Division 23 23 00 Section Refrigerant Piping

1.3 REFERENCES

(Unless otherwise noted, references apply to “latest editions.”)

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.5 - Refrigeration Piping.
- B. ASTM International:
 - 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
 - 3. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
 - 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- C. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP 69 - Pipe Hangers and Supports – Selection and Application.
 - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- E. Underwriters Laboratories Inc.:
 - 1. UL 263 - Fire Tests of Building Construction and Materials.
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 - 5. UL - Fire Resistance Directory.

1.4 DEFINITIONS

(Unless otherwise noted, references apply to “latest editions.”)

- A. Terminology used in this Section is defined in Manufacturer’s Standardization Society Specification 90, “Valve and Fittings Standards.”
- B. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.5 SUBMITTALS

- A. Division 01 Section: "Submittal Procedures": Submittal procedures.
- B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- C. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- E. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods sealed by a registered professional engineer.
- F. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- H. Firestopping Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.
- I. Submit following in accordance with Conditions of Contract and Division 1 Specifications:
 - 1. Shop drawings of items.
 - 2. Complete description of products to be supplied including product data, dimensions materials of construction and specifications.
 - 3. Installation instructions for each product.
 - 4. Layout of piping and ductwork to be isolated including vertical risers showing:
 - a. Support points.
 - b. Weight at support points.
 - c. Isolator type.
 - d. Static deflection expected under actual load.
 - e. Specified static deflection.
 - f. Additional deflection to solid under actual load.
 - g. Ratio of spring height under load to spring diameter.
 - 5. Steel rails, steel base frames, and concrete inertia bases showing all steel work, reinforcing, vibration isolator mounting attachment method and location of equipment attachment bolts.
 - 6. Special details at large scale and other necessary information to convey understanding of work.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

- J. Submission of samples may be requested for each type of vibration isolation device. After approval, samples shall be returned for installation at job site.
- K. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.6 CLOSEOUT SUBMITTALS

- A. Division 01 Section: "Execution and Closeout Requirements": Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

(Unless otherwise noted, references apply to "latest editions.")

- A. NFPA Compliance: Comply with NFPA 13, "Installation of Sprinkler Systems," for hangers and supports used as components of fire protection systems.
- B. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70 "Definitions."
 - 1. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, "Definition and requirements for a nationally recognized testing laboratory."
- C. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.
- D. Supply and install incidental materials needed to meet requirements, even if not expressly specified or shown on drawings without claim for additional payment.
- E. Verify correctness of equipment model numbers and conformance of each component with manufacturer's specifications.
- F. Should any rotating equipment cause excessive noise or vibration, rebalance, realign or do other remedial work to reduce noise and vibration levels. Excessive is defined as exceeding manufacturer's specifications for unit in question.
- G. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- H. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- I. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- J. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- K. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- L. Perform Work in accordance with ASME B31.1 and ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- M. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.9 PRE-INSTALLATION MEETINGS

- A. Division 01 Section: "Administrative Requirements": Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 Section: "Product Requirements" for transporting, handling, storing, and protecting products.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air are not in accordance with the manufacturer's installation procedures.
- B. Maintain manufacturer's required temperature before, during, and after installation of firestopping materials for minimum periods of time as required by the manufacturer.
- C. Provide ventilation in areas to receive solvent cured materials.

1.12 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.13 WARRANTY

- A. Division 01 Section: "Execution and Closeout Requirements": Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 - PRODUCTS

(Unless otherwise indicated, references apply to "latest editions.")

2.1 MATERIALS

- A. Structural Steel: ASTM A 36, "Carbon Structural Steel," steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, "Track Bolts and Nuts," steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, "Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use," steel, plain, flat washers.

2.2 HANGERS AND SUPPORTS

- A. Hangers, Supports, and Components: Provide factory-fabricated products as manufactured by B-Line, Tyco – (Anvil Hangers), Pipe Shields, Inc., or Erico CADDY. Basis of Design shall be B-Line.
 - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA “HVAC Duct Construction Standards,” Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- C. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
- D. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- E. Upper attachments to structures shall have an allowable load not exceeding 3 of the failure (proof test) load but are not limited to the specific methods indicated.
- F. Horizontal Non-Insulated Copper Piping Hangers:
 - 1. Two inch and smaller: Figure No. B3104 CTC.
 - 2. Two and one-half inch and larger: Figure No. B3104 CT.
- G. Insulated Horizontal Piping Hangers: Reheat Water, Glycol Solution, Heating Hot Water, steam and condensate return, refrigerant piping:
 - 1. Two inch and smaller: Figure No. B3108 with metal shield, Figure No. B3151.
 - 2. Two and one-half inch and larger: Figure No. B3108 with metal shield, Figure No. B3151.
- H. Beam Clamps and Attachments:
 - 1. For bolt-on locations to structure, Figure Nos. B3291, B3036, or B3050.
 - 2. Welded beam attachments, Figure No. B3083.
- I. Brackets:
 - 1. For equipment and piping adjacent to walls or steel columns, Figure Nos. B3066, B3063 and B3067 depending on weight to be supported.
- J. Hanger Rods:
 - 1. Hanger rod, Figure No. B3205.
 - 2. Continuous threaded rod, Figure No. ATR.
 - 3. Eye rods, Figure No. B3210 or B3211, depending on load supported.
- K. Trapeze Hangers - Direct Mounting Hangers:

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

1. Grinnell, Figure No. 46.

2.3 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- E. Sealant: Acrylic

2.4 MECHANICAL SLEEVE SEALS

- A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.5 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
 2. Foam Firestopping Compounds: Single component foam compound.
 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 7. Firestop Pillows: Formed mineral fiber pillows.

2.6 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

- B. Dam Material: Permanent:
 - 1. Mineral fiberboard.
 - 2. Mineral fiber matting.
 - 3. Sheet metal.
 - 4. Plywood or particle board.
 - 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
 - 1. Furnish UL listed products or products tested by independent testing laboratory
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 - 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

(Unless otherwise noted, references apply to “latest editions.”)

3.1 EXAMINATION

- A. Division 01 Section: “Administrative Requirements”: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material. Install damming material to arrest liquid material leakage.
- B. Install damming materials to arrest liquid material leakage.
- C. Remove incompatible materials affecting bond.
- D. Drilling or cutting of structural members shall be as detailed / directed by structural engineer.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Comply with MSS SP-69 "Pipe Hangers, and Supports C Selection and Application", and SP-89, "Pipe Hangers and Supports - Fabrication and Installation Practices". Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. Piping shall be supported independently from equipment connections. Supports shall not interfere with removal of equipment.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69, "Pipe Hangers, and Supports C Selection and Application" and as specified in Division 23 Section: "Pipes and Tubes for HVAC Piping and Equipment."
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69, "Pipe Hangers, and Supports C Selection and Application". Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts in new construction prior to placing concrete. Install reinforcing bars through openings at top of inserts.
- F. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Does not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- G. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.

- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36, "Carbon Structural Steel," 2001, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1, "Structural Welding Code – Steel."
- J. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- L. Place hangers within 12 inches of each horizontal elbow.
- M. Use hangers with 1-1/2 inch minimum vertical adjustment.
- N. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- O. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- P. Support riser piping independently of connected horizontal piping.
- Q. Provide copper plated hangers and supports for copper piping.
- R. Design hangers for pipe movement without disengagement of supported pipe.
- S. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- T. Provide clearance in hangers and from structure and other equipment for installation of insulation.
- U. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- V. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- W. Insulated Piping: Provide continuous insulation and vapor barrier through hangers and supports. Comply with the following installation requirements.
 - 1. Riser Clamps: Attach riser clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9. Insulate clamps on piping with insulation and vapor barrier.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3 1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 4 Inches and Larger: Include treated wood inserts.
5. Insert Material: Length to equal to the length of the protective shield.
6. Conform to the table below for maximum spacing of supports and rod sizes:

a. Steel and Copper Pipe:

Nom. Pipe Size – In.	Steel Pipe Max. Span – Ft.	Copper Tube Max. Span – Ft.	Min. Rod Dia. – In.
Up to 3/4	7	5	3/8
1	7	6	3/8
1 1/4	7	7	3/8
1 1/2	9	8	3/8
2	10	8	3/8

3.5 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 2 inches above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install stainless steel escutcheons at finished surfaces.

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3.6 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating to uniform density and texture.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- F. Place intumescent coating in sufficient coats to achieve rating required.
- G. Remove dam material after firestopping material has cured.
- H. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
 - 2. Where pipe, duct, conduit, etc. penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- I. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 - 2. Install escutcheons floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 - 3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
 - 4. Interior partitions: Seal pipe penetrations at all rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

3.7 FIELD QUALITY CONTROL

1. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

- A. Division 01 Section: "Execution and Closeout Requirements": Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

- A. Division 01 Section: "Execution and Closeout Requirements": Requirements for protecting finished work.
- B. Protect adjacent surfaces from damage by material installation.

3.10 APPLICATIONS FOR HANGER AND SUPPORT

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69, "Pipe Hangers and Supports C Selection and Application," for pipe hanger selections and applications that are not specified in piping specification Sections.

3.11 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Adjust for pipe alignment and final equipment connections. Flexible connections shall not be used for adjustment of alignment.

END OF SECTION

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IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section, and the other sections of Division 23.

1.2 SUMMARY:

- A. Section Includes:
 - 1. Engraved Plastic-Laminate Signs.
 - 2. Plastic Pipe Markers.
 - 3. Ceiling Tacks
 - 4. Plasticized Tags.
 - 5. Duct Markers.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 23 Section: "Common Work Results for HVAC."
 - 2. Division 23 Section: "Refrigerant Piping."
 - 3. Division 23 Section: "HVAC Air Distribution."
 - 4. Division 23 Section: "HVAC Fans."

1.3 REFERENCES

(Unless otherwise noted, references apply to "latest editions.")

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.
- B. National Fire Protection Association:
 - 1. NFPA 99 - Standard for Health Care Facilities.

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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1.4 SUBMITTALS

- A. Division 01 Section – “Submittal Procedures”: Submittal Procedures.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.
- E. 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. Furnish copies for Maintenance Manuals as specified in Division 01 Section: “Execution and Closeout Requirements.”
- F. Maintenance Data: Include product data and schedules in maintenance manuals, in accordance with requirements of Division 01.
- G. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- H. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- I. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.6 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ANSI Standards: Comply with ANSI A13.1, for lettering size, length of color field, colors, and viewing angles of identification devices.

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

C. Equipment Lettering and Graphics:

1. General: Coordinate names, abbreviations and other designations used in HVAC identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of HVAC systems and equipment.
 - a. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification, which indicates individual system number as well as service (for example; Unit Heater No. 3).

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience approved by manufacturer.

1.8 PRE-INSTALLATION MEETINGS

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 EXTRA MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two containers of spray-on adhesive.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification materials which may be incorporated in the work include, but are not limited to, the following:

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- B. Manufacturer: Subject to compliance with requirements, provide HVAC identification materials of one of the following:

1. Brady (W.H.) Co.; Signmark Div.
2. Industrial Safety Supply Co., Inc.
3. Seton Name Plate Corp.

2.2 MATERIALS:

- A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 23 sections. Where more than single type is specified for application, selections is Installer's option, but provide single selection for each product category.
- B. Provide pipe markers with the following background colors and designations:

SERVICE	STENCIL DESIGNATION	LETTER COLOR	BACKGROUND COLOR	JACKET
Refrigerated Suction	Refrigerant Suction	Black	Safety Orange	Black
Refrigerated Liquid	Refrigerant Liquid	Black	Safety Orange	Black

2.3 ENGRAVED PLASTIC-LAMINATE SIGNS (Nameplates):

- A. 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.
- B. Thickness: 1/8", except as otherwise indicated.
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- D. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
1. Name and plan number.
 2. Equipment service.
 3. Design capacity.
 4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

- E. Size: Provide approximate 2 1/2" x 4" markers for control devices, dampers, and valves; and 4 1/2" x 6" for equipment.

2.4 PLASTIC PIPE MARKERS:

- A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, UV-resistant color-coded pipe markers, complying with ANSI/ASME A13.1
- B. Small Pipes: For external diameters less than 6" (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. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1 1/2".
- C. Large Pipes: For external diameters of 6" 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. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1 1/2" wide; full circle at both ends of pipe marker, tape lapped 3".
 - 2. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.
- D. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length. Operating pressure of steam systems shall be indicated.
 - 1. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

2.5 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color-coded head.
- B. Color code as follows:
 - 1. HVAC equipment: Yellow.
 - 2. Fire dampers/smoke dampers: Red.
 - 3. Plumbing valves: Green.
 - 4. Heating/cooling valves: Blue.

2.6 PLASTICIZED TAGS:

- A. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately 3 1/4" x 5 5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

2.7 DUCT MARKERS:

- A. Identify air: supply, return, exhaust, intake and relief ducts with duct markers or provide stenciled signs and arrows showing service and direction of air flow.
 - 1. Locate signs near points where ducts enter into concealed spaces and at maximum intervals of 25 feet.
 - 2. Provide identification labels at access panels to locate concealed duct accessories.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Division 09 Section: "Painting and Coating"

3.2 INSTALLATION:

- A. General:
 - 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.
 - 2. Confined Spaces: Provide labels and signs on all duct and equipment doors, plenums, etc. to indicate service and provide operator warnings as required by OSHA, NFPA, and authority having jurisdiction.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- D. Piping System Identification:
 - 1. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

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- a. Plastic pipe markers, with application system as indicated under "Materials" in this section.
 2. Locate pipe markers and color bands as follows on all piping in occupied spaces, above ceilings, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for equipment 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 intermediately at maximum spacing of 25' along each piping run, except reduce spacing to 10' in congested areas.
- E. Equipment Identification:
1. General: Install engraved plastic laminate sign on or near each major item of HVAC 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.
 2. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.
 3. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety precautions, and warn of hazards and improper operations.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify air terminal units and radiator valves with numbered tags.
- I. Tag automatic controls, instruments, and relays. Key to control schematic.
- J. Apply stencil painting in accordance with Division 09 Section: "Painting and Coating"
- K. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

3.3 ADJUSTING:

- A. Adjusting: Relocate any identification device, which has become visually blocked by work of this division or other divisions.

3.4 CLEANING:

- A. Cleaning: Clean face of identification devices.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and the other Sections of Division 22.

1.2 SUMMARY

- A. Coordinate work of this section with all trades.
- B. Work covered in this Section shall be performed after completion of work specified in all Divisions as they related to this work.
- C. Review of design drawings and specifications, and comment on potential problem areas.
- D. Site inspections of ongoing plumbing installation with written report from each visit.
- E. Air leak testing of ductwork system. See Division 23 Section: "HVAC Air Distribution."
- F. Section Includes:
 - 1. Testing adjusting and balancing of air systems.
 - 2. Measurement of final operating condition of HVAC systems.
 - 3. Vibration measurement of equipment operating conditions.
- G. Coordinate with all trades to provide all incidental items not indicated on drawings or in specifications that belong to work described or are required for complete systems balancing, at no additional cost to Owner.
- H. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 23 Section: "Common Work Results for HVAC": Execution Requirements, Closeout Requirements.

1.3 REFERENCES

- A. Associated Air Balance Council:

TESTING, ADJUSTING, AND BALANCING FOR HVAC

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1. AABC MN-1-National Standards for Testing and Balancing, Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating Refrigerating and Air-Conditioning Engineers:
 1. ASHRAE Research Report No. 1162, Air Flow Measurements at Intake and Discharge Openings and Grilles, ASHVE Transactions, Volume 46.
 2. ASHRAE Handbook of Fundamentals.
 3. ASHRAE Standard 70 (RA 2011), Method of Testing the Performance of Air Outlets and Air Inlets.
 4. ASHRAE 111 – Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
 1. NEBB – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
 2. ANSI S1.4 - -Specification for Sound Level Meters.
 3. ANSI S1.11 – Specification for Octave, Half Octave, and Third Octave Band Filter Sets.
 4. ANSI S1.13 – Measurement of Sound Pressure Levels in Air.
 5. ANSI S1.40 – Verification Procedures for Sound Calibration.
- D. Sheet Metal and Air Conditioning Contractors National Association Inc.:
 1. (SMACNA) – Air Duct Leakage Test Manual.
- E. National Institute of Standards and Technology:
 1. NIST

1.4 SUBMITTALS

- A. Division 01 Section: “Submittal Procedures”: Submittal Procedures.
- B. Agency Data:
 1. Submit proof that proposed testing, adjusting, and balancing agency meets the qualifications specified within 30 days of award of contract.
- C. Engineer and Technicians Data:
 1. Submit proof that Test and Balance Engineer assigned to supervise procedures, and technicians proposed to perform procedures meet qualifications specified within 30 days of award of contract.
- D. Procedures and Agenda: Submit synopsis of testing, adjusting, and balancing procedures and agenda proposed to be used for this project within 90 days of award of contract.

1. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guaranty, NEBB Certificate of Conformance Certification, or TABB International Quality Assurance program guarantee.
- E. Document Review:
 1. Submit certification in writing that all design drawings and specifications have been reviewed, and comment on potential problems within 90 days of award of contract.
- F. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this information in maintenance data specified in Division 01 and Division 23 Section: "Common Work Results for HVAC."
- G. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of Test and Balance Engineer. Reports shall be certified proof that systems have been tested, adjusted, and balanced in accordance with referenced standards; are an accurate representation of how systems have been installed; are true representation of how systems are operating at completion of testing, adjusting, and balancing procedures; and are accurate record of final quantities measured, to establish normal operating values of the systems. Follow procedures and format specified below:
 1. Report Format: Report forms shall be those standard forms prepared by referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with project identification and a title descriptive of contents. Divide contents of binder into divisions listed below, separated by divider tabs:
 - a. General Information and Summary
 - b. Air Systems
 2. Report Contents: Provide following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Include certification sheet containing seal and name address, telephone number, and signature of Certified Test and Balance Engineer. Include in this division listing of the instrumentations used for the procedures along with proof of calibration.
 - b. Remainder of the report shall contain appropriate forms containing as minimum, information indicated on standard report forms prepared by AABC and NEBB, for each respective item and system. Prepare schematic diagram for each item of equipment and system to accompany each respective report form.
- H. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- I. NIST Calibration Reports: Submit proof that all testing and balancing instruments and equipment used for this project has been calibrated in accordance with NIST Standards, within period of twelve months prior to starting project.

1. For pharmaceutical GMP facilities, certified cleanrooms, etc. calibration period shall be within six (6) months.
- J. Submit draft copies of report for review prior to final acceptance of Project.
- K. Furnish reports complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- L. Final submittal shall include but not be limited to following:
 1. List of equipment used to perform test and procedures.
 2. Equipment performance data and equipment curves with actual points of performance indicated on curves as compiled during balancing.
 3. Duct traverse readings during balancing.
 4. Room sound pressure levels.
 5. On balance report documents record date and time of reading.
- M. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 Section: "Contract Closeout Procedures": Closeout procedures.
- B. Project Record Documents: Record actual locations of flow measuring stations, balancing valves, and rough setting.
- C. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Authority Having Jurisdiction requirements.
- B. Agency Qualifications:
 1. Employ services of independent testing, adjusting, and balancing agency meeting qualifications specified below, to be single source of responsibility to test, adjust, and balance the building heating, ventilating and air conditioning systems to produce design objectives. Services shall include checking installations for conformity to design, measurement and establishment of fluid quantities of mechanical systems as required to meet design specifications, and recording and reporting results.
 2. Certified by National Environmental Balancing Bureau (NEBB) or by Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in State in which services are to be performed, certified by NEBB or AABC as Test and Balance Engineer.

- C. Work shall be accomplished in accordance with specifications. Procedures specified shall be followed and, if not specifically described herein, in general, shall be in accordance with Associated Air Balance Council's National Standards or National Environmental Balancing Bureau's Procedural Standards.
- D. Design Review:
 - 1. Review all design drawings and specifications. Review shall include:
 - a. Duct pressure classification.
 - b. Specifications on all devices required for balancing.
 - c. Note any potential noise problems.
 - 2. Within 90 days of award of contract, meet with the Architect, Mechanical Contractor, and Building Automation System Contractor to review procedures and agenda and comments on design documents as to potential problem areas.
- E. Shop Drawing Review:
 - 1. Review "Instrumentation and Control for HVAC" shop drawing submittals noting any potential balancing problems. Note comments on submittal, sign, stamp and return to General Contractor. All "Instrumentation and Control for HVAC" submittals must be reviewed by balancing agency prior to review by Architect.
- F. Pre-Balancing Conference: Prior to beginning of testing, adjusting, and balancing procedures, schedule and conduct conference with Architect and representatives of installers of mechanical systems. Objective of conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.
- G. During construction, balancing agency shall inspect the installation of pipe systems, temperature controls, and other component parts of heating, ventilating, and air conditioning systems. Inspections shall be performed periodically as work progresses. Minimum of two inspections are required as follows: (1) when 60 percent of ductwork is installed; (2) when 90 percent of equipment is installed. Balancing agency shall submit brief written report of each inspection to Owner and Architect.

1.7 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum five years' experience certified by AABC, NEBB, or TABB.

1.8 PRE-INSTALLATION MEETINGS

- A. Division 01 Section: "Administrative Requirements": Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.9 SEQUENCING

- A. Division 01 Section: "Summary Of Work" : Work sequence.
- B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.10 SCHEDULING

- A. Division 01 Section: "Administrative Requirements": Coordination and project conditions.
- B. Schedule and provide assistance in final adjustment and test of life safety, smoke evacuation, or smoke control system with Fire Authority.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 Section: "Administrative Requirements": Coordination and project conditions.
- B. Preliminary Work:
 - 1. Inspect project site prior to starting adjustments to verify completion of trades, including general construction, piping system, ductwork system, building automation systems, and electrical systems, as they relate to balancing work. Verify systems are complete and operable before commencing work. Verification shall include but not be limited to following:
 - a. Systems are started and operating in safe and normal condition.
 - b. Ductwork System:
 - 1) Duct joints sealed.
 - 2) Witness leakage tests required under sheet metal section.
 - 3) Dampers and control devices installed.
 - 4) Duct systems are clean of debris.
 - 5) Volume dampers are in place and open
 - c. Proper direction of rotation for motor-driven equipment and for proper speed on multi-speed motors.
 - 1) Fans are rotating correctly.
 - d. Balancing devices are installed and accessible.
 - e. Note problems in general construction of the building that might effect systems performance such as sealing of windows, building joints, exhaust shafts, etc.

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- f. Problems discovered during this inspection shall be reported to General Contractor and Owner.
 - g. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - h. Air coil fins are cleaned and combed.
 - i. Access doors are closed and duct end caps are in place.
2. Contractor shall certify in writing that each piping system has been prepared as per this Section, indicating dates procedures were done and which contractor did work. Submit in writing to Architect before beginning balancing work.

3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus or minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

3.4 ADJUSTING

- A. Verify recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 SYSTEM BALANCE - GENERAL REQUIREMENTS

- A. Balance heating, ventilating, and air conditioning to obtain air and water quantities indicated and required for proper operation of system.

- B. Field work performed under this Section shall be provided under direct supervision of a Registered Professional Engineer.
- C. During all tests, it shall be demonstrated that systems shall be free from leaks and all parts of system will operate correctly. If not, report deficiencies to Contractor and Owner. Balancing Firm shall make final adjustments to equipment as may be required for proper operation, maintaining correct temperatures in all parts of the building. Controls shall be adjusted by "Instrumentation and Control for HVAC" technicians in conjunction with Balancing Firm. Coordinate setpoints and adjustments with "Instrumentation and Control for HVAC."
- D. Balancing of heating and air conditioning, special exhaust and ventilating systems to achieve air quantities specified at each air inlet, outlet, or damper shown on plans at proper conditions of static pressure and temperature differential.
- E. Study and report on excessive noise conditions, which may develop during system balancing. Report shall be sent to Architect.

3.6 AIR SYSTEM BALANCE

- A. Prior to air balance, witness duct leak tests as performed under Division 23 Section: "HVAC Air Distribution."
- B. In conjunction with Division 23 "Instrumentation and Controls for HVAC," equipment shall be started per design sequence. Determine fan airflow at rated speed. If airflow is not within 10% of design capacity of rated speed, review system conditions, procedures, and recorded data. Check and record pressure drops across filters, compensate for clean versus dirty filters, coils, sound traps, airflow sensors, etc., to indicate excessive pressure loss or leakage. Resolve problems with appropriate contractor. If systems are properly operating, and airflow is still unacceptable, adjust fan drive in accordance with manufacturer's recommendations to obtain proper airflow and static pressure. Systems shall be balanced and operated at lowest feasible static pressure with allowance for filter loading. Record fan suction pressure, fan discharge pressure, amperage and airflow measurement. Correct fan curves to indicate new points of balance. Fan motor shall not be overloaded.
- C. With fan systems adjusted and dampers set to handle normal minimum outdoor air, perform following tests and compile following information:
 - 1. Air Handling Equipment:
 - a. Design Conditions
 - 1) Outdoor Airflow
 - b. Installed Equipment
 - 1) Manufacturer
 - 2) Motor serial number
 - 3) Motor type and efficiency, rating, voltage, phase, full-load amperes.
 - c. Field Test
 - 1) Fan Speed
 - 2) No-load operating amperes
 - 3) Fan motor operating amperes

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- 4) Calculated motor output
 - d. Test for Total Air
 - 1) Sum of discharge, exhaust, return air and outside air ducts.
 - 2) Number and locations of velocity readings taken.
 - 3) Duct average velocity
 - 4) Total airflow
- D. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- E. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.7 SCHEDULES

A. Report Forms

- 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
- 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date

4. Air Cooled Condensing Unit:
 - a. Identification/number
 - b. Location
 - c. Manufacturer
 - d. Model number
 - e. Serial number
 - f. Entering DB air temperature, design and actual
 - g. Leaving DB air temperature, design and actual
 - h. Number of compressors

5. Duct Traverse:
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity
 - g. Test air flow
 - h. Duct static pressure
 - i. Air temperature
 - j. Air correction factor

6. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage

3.8 CALIBRATION

- A. During testing and balancing, inspect temperature sensors, pressure sensors, digital indicators, and thermometers, etc. provided under Division 23. Report discrepancies to the Contractor for replacement or recalibration.

3.9 RE-BALANCE

- A. After Architect's review of test and balance report submittal, make adjustment in any balancing point as required by Architect, to correct discrepancies between balance report and design, at no additional cost.

END OF SECTION

**SECTION 23 07 00
HVAC INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the contract, including General and Supplemental Conditions and Division 01 Specifications, apply to this section and the other sections of Division 23.

1.2 SUMMARY

- A. Section includes:
1. Insulation Materials:
 - a. Flexible Elastomeric
 - b. Glass Mineral Wool Blanket Insulation
 2. Adhesives.
 3. Mastics.
 4. Tapes.
 5. Securements.
- B. Related Sections: The following sections contain requirements that relate to this section.
1. Division 23 Section: "Hangers and Supports for HVAC Piping and Equipment": Product and Execution requirements for inserts at hanger locations.
 2. Division 23 Section: "Identification for HVAC Piping and Equipment": Product requirements for HVAC piping and equipment identification.

1.3 REFERENCES

(Unless otherwise noted, references apply to "latest editions.")

- A. ASTM International:
1. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 2. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 3. ASTM C423 - Standard for Reverberation Room Method.
 4. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 5. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 6. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

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7. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 8. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
 9. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 10. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 11. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 12. ASTM C1393 - Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks .
 13. ASTM 1622 - Standard Test Method for apparent density, apparent density, apparent overall density.
 14. ASTM D3575 - Standard Test Methods for flexible cellular materials made from Olefin Polymers, closed cell materials, flexible cellular, Olefin Polymers, Buoyancy, etc.
 15. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
 16. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 17. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 18. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 19. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
 20. ASTM E2231 – Standard Practice for Specimen Preparation of Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics.
- B. Sheet Metal and Air Conditioning Contractors':
1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- C. Underwriters Laboratories Inc.:
1. UL 1978 - Standard for Safety for Grease Ducts.
- D. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE).
- E. North American Insulation Manufacturers Association (NAIMA).
- F. NAIMA – “Guide to Insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation.”
- G. “National Commercial & Industrial Insulation Standards” – MICA Manual
- H. National Fire Protection Association (NFPA)
- I. Underwriter’s Laboratories Environmental (UL Environment).

1.4 SUBMITTALS

- A. Division 01 Section: "Submittal Procedures": Submittal Procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Samples: Submit two samples of representative size illustrating each insulation type.
- D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Duct insulation, Coverings, and Linings: UL/ULC Classified per UL 723 or Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.
- E. Perform Work in accordance with all applicable codes, standards and local authorities having jurisdiction requirements.
- F. Fire-Test-Response Characteristics: Insulation and related materials shall be UL/ULC Classified per UL 723 or have fire-test response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke developed index of 150 or less.
- G. Formaldehyde Free: Third party certified with UL Environment Validation.
- H. Biosoluble: As determined by research conducted by the International Agency for Research on Cancer (IARC) and supported by revised reports from the National Toxicology Program (NTP)

and the California Office of Environmental Health Hazard Assessment. Certified by European Certification Board for Mineral Wool Products (EUCEB).

- I. Recycled Content: A minimum of 50 percent recycled glass content certified and UL Validated.
- J. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation Products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
- K. Living Building Challenge-Declare Red List Free.
- L. Products shall contain no polybrominated diphenyl ethers (PBDE) such as Penta-BDE.
- M. Insulation materials shall be tested and rated according to ASTM Test Method C-177 to determine k-factors. ASTM C 335 is for pre-formed pipe insulation. C177 is for flat slab materials ONLY; such as board products, etc.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.7 PRE-INSTALLATION MEETINGS

- A. Division 01 Section: "Administrative Requirements": Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 Section: "Product Requirements": Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping. Remove and replace any wet or damaged unsatisfactory insulation at the Architect's direction.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 Section: "Product Requirements": Environmental conditions effecting products on site.

- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 WARRANTY

- A. Division 01 Section: "Warranties and Bonds": Product warranties and product bonds.
- B. Furnish two (2) year manufacturer warranty for manmade fiber.

1.12 DEFINITIONS

- A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per degree F.
- B. UL GREENGUARD: Provides independent third party, Indoor Air Quality (IAQ) certification of products for emissions of respirable particles and Volatile Organic Compounds (VOC's), including formaldehyde and other specific product related pollutants. Certification is based upon criteria used by EPA, OSHA, and WHO.
- C. EPA: Environmental Protection Agency.
- D. WHO: World Health Organization.
- E. ASJ+: All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with a polypropylene outer film layer leaving no paper exposed.
- F. ASJ: Al-service jacket.
- G. FSK: Foil, scrim, Kraft paper.
- H. FSP: Foil, Scrim, polyethylene.
- I. PVDC: Polyvinylidene chloride.
- J. SSL+: Self-Sealing Lap with Advanced Closure System.
- K. SSL: Self-sealing lap.
- L. ASJ Max: All service jacket composed of aluminum foil with tri-directional reinforcing scrim bonded to Kraft paper with a polypropylene outer layer leaving no exposed paper.

- M. PSK: Poly Scrim Kraft.
- N. PVC: Polyvinyl Chloride.
- O. Glass Mineral Wool: Interchangeable with fiber glass, but replacing the term in the attempt to disassociate and differentiate Glass Mineral Wool from the potential health and safety of special purpose or reinforcement products that do not meet the bio solubility criteria of insulation made from glass. Rock Mineral Wool will replace the traditional Mineral Wool label. Both are used in lieu of the Mineral Fiber label.
- P. ECOSE® Technology: a revolutionary binder chemistry that enhances the sustainability of products. The "binder" is the bond that holds the Glass Mineral Wool product together and gives the product its shape and brown color. ECOSE Technology is a plant based sustainable chemistry that replaces the phenol/formaldehyde (PF) binder traditionally used in Glass Mineral Wool products. Products using ECOSE Technology are formaldehyde free and have greater reduced global warming potential than compared to products of the past.
- Q. UL GREENGUARD Gold Certification: (formerly known as GREENGUARD Children & Schools Certification) offers stricter certification criteria, considers safety factors to account for sensitive individuals (such as children and the elderly), and ensures that a product is acceptable for use in environments such as schools and healthcare facilities. It is referenced; by both The Collaborative for High Performance Schools (CHPS) and the Leadership in Energy Environmental Design (LEED) Building Rating Systems.
- R. UL Environment Formaldehyde Free Verification Requirements: For a product to be verified as formaldehyde free, product samples must have a measured emission factor of less than or equal to 5 µg/m²h at 24 elapsed hours or 3 µg/m²h at 336 elapsed hours. An emission factor of 5 µg/m²h corresponds to measured chamber concentration of 2.5 µg/m³ for a typical building ratio of 0.5 m²/m³. This chamber concentration is comparable to, or below typical outdoor air concentrations. This demonstrates that the formaldehyde exposure from products labeled as formaldehyde free will not contribute to airborne formaldehyde concentrations at greater levels than those found in the natural outdoor environment.
- S. Declare and The Living Building Challenge – The Living Building Challenge is a philosophy, advocacy tool and certification program that addresses development at all scales. The purpose of The Living Building Challenge is to define the most advanced measure of sustainability in the built environment today and acts to diminish the gap between current limits and ideal solutions. Declare supports The Living Building Challenge by providing a transparent materials database that project teams can select from to meet Imperative 11.
- T. Imperative 11, Red List – requires that manufacturers disclose the ingredients in their products to insure that they are free of Red List chemicals and materials. The Red List represents the “worst in class” materials, chemicals and elements known to pose serious risks to human health and the greater ecosystem.
- U. Underwriters Laboratories Environment (UL Environment): offers independent green claims validation, product assessment and certification. UL GREENGUARD provides third party credibility for sustainable products.

- V. UL Environment Claims Validation (ECV): service and label tests a manufacturer's product and validates that the environmental claims they make in their marketing and packaging materials are factual. This Environmental Claims Validation (ECV) service will allow manufacturers to verify that their products contain a quantifiable amount of recycled content and, as such, help limit raw material extraction and reduce landfill waste. It also will enable products to qualify for LEED® points under Pilot Credit 43: MR – Certified Products.
- W. EUCEB: exonerated fiber from a health and safety standpoint by the European Certification Board process.
- X. Recycled Content: materials such as bottled glass collected at curbside or other collection sites after consumer use and/or materials used or created from one manufacturing process which are collected as scrap and placed back into another manufacturing process rather than being placed in a landfill or incinerated.
- Y. Polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE fire retardants: have been linked to adverse health effects after exposure in low concentrations.
- Z. UL Classified: UL has tested and evaluated samples of the product with respect to certain properties of the product. UL Classifies products to:
 - 1. Applicable UL requirements.
 - 2. Standards for safety.
 - 3. Standards of other National and International organizations.
- AA. EPD: Environmental Product Declaration. A third party verified document that reports environmental data of products based on the Life Cycle Assessment (LCA) and other relevant information, and in accordance with the International Standard ISO 14025 (Type III Environmental Declarations).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles blow introduce lists, the following requirements apply to product selection.
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

- A. Refer to Part 3 execution schedule for requirements regarding where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury or mercury compounds.
- C. Insulation products shall contain no formaldehyde-based binders or shall be third-party certified for conformance with GREENGUARD Gold or Indoor Advantage Gold. (GREENGUARD Children and Schools is now called GREENGUARD Gold)
- D. When product to be in contact with austenitic stainless steel is tested according to ASTM C795 (which includes ASTM C692 and ASTM C871), the PH of the leach water from the specific material supplied shall be greater than 7.0 but not greater than 11.7 at 77°F. An acceptable proportion of sodium plus silicate ions to the chloride ions as found by leaching from the insulation is shown in the “plot point” of figure 6 in ASTM C795.
- E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- F. Insulation materials applied to carbon steel shall be Mass Load Corrosion Rate (MLCR) tested per ASTM 1617.
- G. Foam insulation materials shall not utilize CFC or HCFC blowing agents in the manufacturing process.
- H. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products:
 - a. Aeroflex USA Inc.: Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. Nomaco; K-Flex Pipe
 - 2. Water Vapor Permeability: 0.02 perm-inch per ASTM E96 Procedure A.
 - 3. Thermal Conductivity: 0.27 at 75 degrees F
 - 4. Warranty: 25 year warranty against breakdown of the membrane due to ultraviolet radiation.
 - 5. Seal Tape: Thermoplastic rubber membrane backed with pressure sensitive adhesive.
- I. Glass Mineral Wool Blanket Insulation: Glass mineral wool bonded with a thermosetting resin. Comply with ASTM C 553, Types I, II and III, ASTM C 1136, Type II and ASTM C 1290, Type I or Type III, UL/ULC Classified per UL 723 or FHC 25/50 per ASTM E 84. UL GREENGUARD Gold Certified and UL Environment Validated to be formaldehyde free. Product shall contain no polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE. Factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 “Factory-Applied Jackets” Article.
 - 1. Products:
 - a. Knauf Insulation; Atmosphere Duct Wrap with Ecose® Technology
 - b. CertainTeed Corp.; Duct Wrap.
 - c. Johns Manville; Microlite Duct Wrap or Microlite EQ.
 - d. Owens Corning; All-Service Duct Wrap Type 150.
 - 2. Maximum K-Factor: 0.24 at 75 deg. F. and material thickness compressed 25%.

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3. Minimum Density: 1.5 pounds per cubic foot.
- J. Glass Mineral Wool Board Insulation: Glass mineral wool bonded with a thermosetting resin. UL/ULC Classified per UL 723 or FHC 25/50 per ASTM E 84. Comply with ASTM C 612, Type IA or Type IB. Living Building Challenge – Declare Red List Free. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ+ or ASJ. Factory-applied jacket requirements are specified in Part 2 “Factory-Applied Jackets” Article.
 1. Products:
 - a. Knauf Insulation; Earthwool Insulation Board with Ecose® Technology for temperatures up to 450° F.
 - b. CertainTeed Corp.; Commercial Board.
 - c. Johns Manville; 800 Series Spin-Glas, Type 814.
 - d. Owens Corning; Fiberglas 700 Series for operating temperatures up to 450°F.
 2. Maximum K-Factor: 0.23 at 75° F.
 3. Minimum density: 2.8 pounds per cubic foot.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II Class I.
 1. Products:
 - a. Armacell LCC; Armaflex 520 Adhesive, Armaflex 520 BLV Low-VOC Adhesive....
 - b. Foster Products Corporation, H. B. Fuller Company; 85-60.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Products:
 - a. Foster Products Corporation, H. B. Fuller Company; 85-70.
 - b. Eagle Bridges - Marathon Industries, Inc.; 225.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 1. Products:

- a. Foster Products Corporation, H. B. Fuller Company; 30-90.
 - b. Eagle Bridges - Marathon Industries, Inc.; 590.
 - c. Mon-Eco Industries, Inc.; 55-40.
 - d. Pittsburg Corning, PITTCOTE 404 Coating.
 - e. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Products:
 - a. Foster Products Corporation, H. B. Fuller Company; 35-00.
 - b. Eagle Bridges - Marathon Industries, Inc.; 550.
 - c. Mon-Eco Industries, Inc.; 55-50.
 - d. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 200 deg F.
 4. Solids Content: 63 percent by volume and 73 percent by weight.
 5. Color: White.

2.5 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 - e. HiCube Coating: HC108
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

- b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 - e. HiCube Coating: HC106
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
 1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
 - b. Compac Corp.; 130.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
 - d. Venture Tape; 1506 CW NS.
 - e. HiCube Coating: HC404
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.
 1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - d. Venture Tape; 3520 CW.
 - e. HiCube Coating: HC100
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.
- E. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing, EPA approved anti-microbial additive.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armacell LLC; AP/Armaflex Insulation Tape
 - b. Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 Section: "Administrative Requirements." Coordination and project conditions.
- B. Verify piping, equipment and ductwork has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that applies to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.

- J. Install insulation continuously through hangers and around anchor attachments.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at anchors and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with self-sealing factory-applied jackets as follows:
 - 1. Locate all longitudinal pipe insulation jacketing laps in least visible location.
 - 2. Draw jacket tight and smooth.
 - 3. For proper sealing, seal lap joints with reasonable pressure being applied with a plastic squeegee or sealing tool.
 - 4. Vapor seal all circumferential joints with factory furnished matching pressure sensitive butt strips installed with reasonable pressure being applied with a plastic squeegee or sealing tool.
- N. Install insulation with non-self-sealing factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive selfsealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- O. Cut and install insulation in a manner to avoid compressing insulation more than 25 percent of its original nominal thickness.
- P. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- Q. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- R. Replace insulation on existing piping, and equipment where indicated on the drawings. Match insulation type and thickness indicated by the insulation schedule at the end of this section.
- S. Replace insulation on new and existing piping, and equipment where insulation is damaged during construction or removed for testing and balancing work.
- T. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.
 - 7. Unions.
 - 8. Heating water strainers (1-inch and less).
 - 9. Flanges.
 - 10. Expansion joints.
 - 11. Heating water valves (1-inch and less).
- U. Duct and plenum liner application: Refer to Division 23 Section: "HVAC Air Distribution."

3.4 BUILDING PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

3.5 DUCT AND PLENUM INSULATION INSTALLATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with insulation pins.
1. Install either capacitor discharge weld pins and speed washers or cupped head, capacitor discharge weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches oc.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches oc. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation; maximum 25 percent compression.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - g. Pressure sensitive foil tapes shall be a minimum 3" wide and shall be applied with moving pressure using a squeegee or other appropriate sealing tool.
 2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with ½ inch outward clinching staples, 1 inch oc. Install vapor barrier consisting of vapor barrier acrylic based tape; matching the facing, or factory or field-applied jacket, adhesive, vapor barrier mastic, and sealant at joints, seams, and protrusions. Follow NAIMA's "Guide to insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation" for additional details when installing Pipe and Tank Insulation.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg. F at 18 foot intervals. Vapor stops shall consist of vapor barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - c. Where vapor retarder performance is required, all penetrations and damage to the facing shall be repaired using pressure sensitive foil tape or mastic prior to system startup.
 - d. Pressure sensitive foil tapes shall be a minimum 3" wide and shall be applied with moving pressure using a squeegee or other appropriate sealing tool.
 3. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches oc.
 4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat oval duct elbows with individually mitered gores cut to fit the elbow.

5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6 inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches oc.

B. Board Insulation Installation on Ducts and Plenums: Secure with insulation pins.

1. Install either capacitor discharge weld pins and speed washers or cupped head, capacitor discharge weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. Apply insulation with joints butted as close as possible to the duct surface.
 - b. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches oc.
 - c. On duct sides with dimensions larger than 18 inches, space pins 16 inches oc. Each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - d. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - e. Do not over compress insulation during installation.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - g. All joints shall be sealed using minimum 3 inch wide pressure sensitive, acrylic based tape; matching the facing. Tape shall be firmly rubbed; using a plastic squeegee or sealing tool to assure complete bond.
2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Install vapor barrier consisting of vapor barrier acrylic based tape; matching the facing, or factory or field applied jacket, adhesive, vapor barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18 foot intervals. Vapor stops shall consist of vapor barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - c. All joints shall be sealed using minimum 3 inch wide pressure sensitive, acrylic based vapor barrier tape; matching the facing. Tape shall be firmly rubbed; using a plastic squeegee or sealing tool to assure complete bond.
3. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat oval duct elbows with individually mitered gores cut to fit the elbow.
4. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6 inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches oc.

(The use of adhesive to secure insulation to ductwork is not advised. It MAY affect the FHC of the insulation. It also adversely affects the installation; particularly of Duct Wrap

because the insulation is more difficult to position on the ductwork; especially in tight spaces.)

3.6 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Fittings shall be insulated to same thickness as the adjoining insulation. Apply fittings per fitting manufacturer's instructions. When required by specification, a hard insert of sufficient length shall be utilized to avoid compression of the insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 - 9. Stencil or label the outside insulation jacket of each union with the word UNION." Match size and color of pipe labels.

3.7 GLASS MINERAL WOOL INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes.

1. Secure pipe insulation to pipe using self-sealing lap system.
2. On high temperature piping, above 500° F apply insulation using double layer and staggered joints. For double layer installation, secure the unjacketed inner layer using filament tape; without deforming insulation material. All joints and ends must be firmly butted and secured with appropriate securing material.
3. Firmly rub all longitudinal and circumferential joints using a squeegee or sealing tool.
4. Longitudinal jacket laps for pipe insulation installed on piping systems with operating temperatures below ambient shall be vapor sealed with factory-applied pressure-sensitive adhesive vapor retarder, self-sealing lap. For proper sealing, firmly rub lap joints with reasonable pressure being applied with a plastic squeegee or sealing tool. Vapor seal all circumferential joints with factory-furnished, matching pressure-sensitive butt strips installed with reasonable pressure being applied with a plastic squeegee or sealing tool. Additionally, coat raw edges of pipe insulation sections with vapor retarder mastic at 12 foot to 21 foot intervals and on either side of all fittings, flanges, or valves. Vapor retarder mastic shall completely coat the ends of the pipe and extend onto the bore of the pipe insulation and onto the jacketing a minimum of 2 inches. Follow NAIMA's "Guide to Insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation" for additional details.
5. Install metal shields between hangers or supports and the pipe insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Inserts shall be of equal thickness to the adjacent insulation, and shall be vapor sealed as required. Insulation shields shall be no less than the following lengths:
 - a. 1-1/2 inch to 2-1/2 inch IPS: 10 inch long.
 - b. 3 inch to 6 inch IPS: 12 inch long.
 - c. 8 inch to 10 inch IPS: 16 inch long.
 - d. 12 inch and over IPS: 22 inch.
6. For piping subject to abuse in mechanical rooms or high traffic areas, protect insulation from mechanical abuse by the use of appropriate thickness of PVC jacketing, metal jacketing, or laminated self-adhesive water and weather seal.
7. For piping exposed to the elements, install Redi-Klad Pipe Insulation with 4 inch butt strips and self-sealing lap, a jacket that shall be a minimum 0.016 inch thick aluminum jacket with factory-applied moisture barrier, or a minimum 0.010 inch thick stainless steel jacket with factory-applied moisture barrier. Fittings shall be of similar materials. Apply all jacketing per manufacturer's recommendations for the conditions.
8. For piping operating below ambient temperature or in high abuse areas, install Redi-Klad Pipe Insulation with 4 inch butt strips and self-sealing lap. Follow the same guide lines when using Redi-Klad as indicated for ASJ+-SSL+ above.

3.8 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- #### A.
- Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 INSULATION APPLICATION SCHEDULE

- A. Acceptable insulation materials, thickness and vapor retarder requirements are identified for each application and size range. If more than one material is listed for an application and size range, selection from the materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Fire-suppression piping.
2. Drainage piping located in crawl spaces.
3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
5. Exhaust ductwork
6. Factory-insulated flexible ducts.
7. Factory-insulated plenums and casings.
8. Flexible connectors.
9. Vibration-control devices.
10. Factory-insulated access panels and doors.

- C. All supply and outside air ductwork with internal sound lining shall be externally insulated.

- D. Where metal ducts are specified to have internal duct liner, the thickness of the external insulation may be reduced by one inch, except minimum duct external insulation thickness shall be 1 inch.

3.10 HVAC PIPING INSULATION APPLICATION SCHEDULE:

1. Unconditioned spaces include locations where summer temperature and humidity conditions are similar to outdoor conditions (such as mechanical rooms ventilated with unconditioned outdoor air, parking garages, pedestrian tunnels, etc.). Pipes in these spaces to be insulated similar to outdoor requirements.
2. Where rigid pipe insulation (cellular glass, etc.) is scheduled, provide mineral fiber through and 6 inches beyond pipe sleeves, to allow for pipe expansion.

Miscellaneous (all supply and return)	Type of Insulation Material	Vapor Retarder Required	Pipe Size	Insulation Thickness Required
Air conditioning condensate drain, equipment drain, and non-steam humidifier drain	Flexible Elastomeric	No	<1"	0.5"
			1" to <8"	1"
			≥8"	1.5"
Refrigerant pipe	Flexible Elastomeric	No	All	1"

3.11 HVAC DUCTWORK INSULATION APPLICATION SCHEDULE

1. Unconditioned spaces include locations where summer temperature and humidity conditions are similar to outdoor conditions (such as mechanical rooms ventilated with unconditioned outdoor air, parking garages, pedestrian tunnels, etc.)
2. Top of ductwork located outdoors shall be provided with polyurethane board insulation of equal thickness to sides and bottoms. Taper insulation to shed water, minimum ¼" per foot slope, with insulation thickness at low edges equal to scheduled insulation thickness.
3. All diffuser cones, air valves, damper boxes, HVAC equipment, coils, coil headers, casings, plenums, air measuring devices, chilled beams, etc. shall be insulated.

Outdoor air ductwork, plenums, and accessories	Type of Insulation Material	Vapor Retarder Required	Insulation Thickness Required
Concealed (Indoor)	Glass Mineral Wool Blanket	Yes	1.5"
Exposed (Indoor)	Glass Mineral Wool Board	Yes	2"

GLEN ARM SIGN AND SIGNAL SHOP – HVAC
SYSTEM REPLACEMENT
BALTIMORE COUNTY, MARYLAND
JOB ORDER NUMBER - 0001042031

PROJECT MANUAL
100% Construction Documents
1-17-2025

END OF SECTION

HVAC INSULATION

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**SECTION 23 23 00
REFRIGERANT PIPING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other Sections of Division 23.

1.2 SUMMARY

- A. Section includes:
1. Pipes, tubing, fittings, and specialties.
 2. Special duty valves.
 3. Refrigerants.
 4. Installation of refrigerant piping.
 5. Engineered Wall Seal and Insulation Protection System.
- B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of packaged air conditioning equipment.
- C. Design and installation shall be provided in accordance with equipment manufacturer's recommendations.
- D. Related Sections: The following sections contain requirements that relate to this section:
1. Division 23 Section: "Common Work Results for HVAC": Labeling and identification of refrigerant piping.
 2. Division 23 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
 3. Division 23 Section: "Hangers and Supports for HVAC Piping and Equipment."
 4. Division 23 Section: "Identification for HVAC Piping and Equipment."
 5. Division 23 Section: "HVAC Insulation": Pipe insulation.
 6. Division 26 Section: "Raceways and Boxes for Electrical Systems": Requirements of conduits and boxes housing electrical connections specified by the section.

1.3 REFERENCES

- A. Air-Conditioning and Refrigeration Institute:
1. ARI 495 - Refrigerant Liquid Receivers.
 2. ARI 710 - Liquid-Line Driers.
 3. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Dryers.

REFRIGERANT PIPING

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4. ARI 750 - Thermostatic Refrigerant Expansion Valves.
 5. ARI 760 - Solenoid Valves for Use with Volatile Refrigerants.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- C. American Society of Mechanical Engineers:
1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 3. ASME B31.5 - Refrigeration Piping.
 4. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- D. ASTM International:
1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 4. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 5. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 6. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
- E. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 2. AWS D1.1 - Structural Welding Code - Steel.
- F. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- G. Underwriters Laboratories Inc.:
1. UL 429 - Electrically Operated Valves.

1.4 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves or equipment.
- C. Provide pipe hangers and supports in accordance with ASME B31.5, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.
- D. Flexible Connectors: Use at or near compressors where piping configuration does not absorb vibration.

1.5 SUBMITTALS

- A. Division 01 Section: "Submittal Procedures": Submittal Procedures.
- B. Product data for the following products:
 - 1. Each type valve specified.
 - 2. Each type refrigerant piping specialty specified.
- C. Submit Shop Drawings showing:
 - 1. The design and layout of refrigerant piping, valves, expansion valves, heat recovery boxes, branch selector boxes, drains, accumulators, traps, hot gas bypass, filters, and miscellaneous specialties, etc.
 - 2. Pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details.
 - 3. Interface and spatial relationship between piping and proximate to equipment.
- D. Provide a letter from the equipment manufacturer certifying the refrigerant pipe layout indicated on the refrigerant pipe shop drawing is being provided in accordance with the equipment manufacturer's criteria including layout, pipe length, pipe offsets, and pipe size.
- E. Brazer's Certificates signed by Contractor certifying that Brazer's comply with requirements specified under "Quality Assurance" below.
- F. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual specified in Division 01 and in Division 23 Section: "Common Work Results for HVAC."
- G. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
 - 4. Refrigerant Specialties: Submit manufacturers catalog information including capacity, component sizes, rough-in requirements, and service sizes for the following:

- a. Refrigerant moisture and liquid indicators.
 - b. Refrigerant strainers.
 - c. Refrigerant pressure regulators.
 - d. Refrigerant pressure relief valves.
 - e. Refrigerant filter-driers.
 - f. Refrigerant solenoid valves.
 - g. Refrigerant expansion valves.
 - h. Electronic expansion valves.
- H. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- I. Test Reports: Indicate results of refrigerant leak test and piping system pressure test.
- J. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- K. Manufacturer's Certificate: Certify Products meet or exceed specified requirements
- L. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
- M. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.6 CLOSEOUT SUBMITTALS

- A. Division 01 Section: "Execution and Closeout Requirements": Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and refrigerant accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Perform Work in accordance with authority having jurisdiction and AWS D1.1 for welding hanger and support attachments to building structure.
- C. Regulatory Requirements: Comply with provisions of the following codes:
 - 1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping, latest edition.
 - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration, latest edition.
 - 3. International Mechanical and Plumbing Codes, latest edition.

4. PHCC: National Standard Plumbing Code, latest edition.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.
- C. Design piping system and hangers and supports under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

1.9 PRE-INSTALLATION MEETINGS

- A. Division 01 Section: "Administrative Requirements": Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 Section: "Product Requirements": Product storage and handling requirements.
- B. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.
- C. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 Section: "Product Requirements".
- B. Do not install underground piping when bedding is wet or frozen.

1.12 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.13 COORDINATION

- A. Division 01 Section: “Administrative Requirements”: Requirements for coordination.
- B. Coordinate the installation of roof piping supports and roof penetration with Division 07.

1.14 WARRANTY

- A. Division 01 Section: “Execution and Closeout Requirements”: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for valves excluding packing.

1.15 MAINTENANCE MATERIALS

- A. Division 01 Section: “Execution and Closeout Requirements”: Spare parts and maintenance products.
- B. Furnish two refrigerant oil test kits each containing everything required for conducting one test.

1.16 EXTRA MATERIALS

- A. Division 01 Section: “Execution and Closeout Requirements”: Spare parts and maintenance products.
- B. Furnish two packing kits for each size and valve type.
- C. Furnish two refrigerant filter-dryer cartridges of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Refrigerant Valves and Specialties:
 - a. Alco Controls Div, Emerson Electric.
 - b. Danfoss Electronics, Inc.
 - c. EATON Corporation, Control Div.
 - d. Henry Valve Company.
 - e. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division.
 - f. Sporlan Valve Company.

2.2 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3, Article "Pipe Application" for identification of systems where the below specified pipe and fitting materials are used.
- B. Drawn-Temper Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- C. Annealed-Temper Copper Tubing: ASTM B280, Type ACR
 - 1. Contractor Option: Pre-Insulated Line Sets
 - a. UL-Recognized
 - b. ASTM C-534 and ASTM E-84
 - c. Closed Cell Elastomeric
 - d. UV Resistant Rated Insulation

2.3 FITTING AND JOINING MATERIALS

- A. Fitting Materials
 - 1. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.
- B. Joining Materials
 - 1. Brazing Filler for Joining Similar Metals: AWS A5.8, Classification BCuP series, with melting range from 1190 to 1480°F.
 - 2. Brazing Filler for Joining Dissimilar Metals: AWS A5.8, Classification BAg series, with melting range from 1125 to 1370°F.
- C. ACR Press Fittings – Contractor Option
 - 1. ACR fittings shall be refrigerant grade copper fitting suitable for brazing or mechanically sealed/pressed ACR fittings as manufactured by Conex Banninger.
 - 2. Fitting body shall consist of Refrigerant grade copper per ASTM-B8280 with internal NHBR sealing element. Mechanical press shall be of 3 point design. MaxiPro fittings shall incorporate hook lockingseal on top of fitting cup and pressed with Rothenberger approved press jaws. Fitting shall be supplied contaminant free in vapor sealed bags direct from factory. Fittings shall be marked with 48 bar or 700PSI and certified to UL-109, UL-207, and ASHRAE-15. Installing contractor shall be factory trained and owner shall receive 5 year warranty on all pressed connections. Proof of training shall be provided to owners rep at beginning of project.

2.4 VALVES

- A. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

- B. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- C. Ball Valves:
 - 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals, soldered ends.
 - 2. Maximum working pressure: 700 psig
 - 3. Maximum working temperature: 325 degrees F
- D. Check Valves - Smaller Than 7/8 inch: 700 psig maximum operating pressure, 300 °F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.
- E. Check Valves - 7/8 inch and Larger: 700 psig maximum operating pressure, 300°F maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.
- F. Solenoid Valves: ARI 760, 250°F temperature rating, 700 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2 inch conduit adapter, and 24 volt, 60 Hz. normally closed holding coil.
- G. Evaporator Pressure Regulating Valves: pilot-operated, forged brass or cast bronze; complete with pilot operator, stainless steel bottom spring, pressure gage tappings, 24 volts DC, 50/60 Hz, standard coil; and wrought copper fittings for solder end connections.
- H. Thermal Expansion Valves: thermostatic adjustable, modulating type; size as required for specific evaporator requirements, and factory set for proper evaporator superheat requirements. Valves shall have copper fittings for solder end connections; complete with sensing bulb, a distributor having a side connection for hot gas bypass line, and an external equalizer line.
- I. Refrigerant Pressure Relief Valves: Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB; for standard 700 psig setting; selected to ASHRAE 15.
- J. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.
- K. Electronic Expansion Valves
 - 1. Brass bodies with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.
 - 2. Evaporation Control System: Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, pre-selection allowance for electrical defrost and hot gas bypass.
 - 3. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high

and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.5 REFRIGERANT PIPING SPECIALTIES

- A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.
- B. Strainers: 700 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
- C. Moisture/liquid Indicators: 700 psig maximum operation pressure, 200°F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
- D. Filter-driers: ARI 710, 700 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
 - 1. Standard capacity desiccant sieves to provide micronic filtration.
- E. Suction Line Filter-Drier: ARI 710, 700 psig maximum operation pressure, 225°F maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Permanent filter element shall be molded felt core surrounded by a desiccant for removal of acids and moisture for refrigerant vapor.
- F. Suction Line Filters: 700 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter core kit, including gaskets, as follows:
- G. Flanged Unions: 700 psig maximum working pressure, 330°F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8 inch through 1-5/8 inch unions shall be forged steel, and for 2-1/8 inch through 3-1/8 inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.
- H. Flexible Connectors: 700 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.
- I. Suction Accumulators: Provide as manufactured by Refrigeration Research, Inc.
- J. Refrigerant Receivers
 - 1. Internal Diameter 6 inch and Smaller: ARI 495, UL listed, steel, brazed; 700 psig pressure rating, with taps for inlet, outlet, and pressure relief valve.
 - 2. Internal Diameter 6 inch and Larger: ARI 495, welded steel, tested and stamped in accordance with ASME Section VIII; 700 psig with taps for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

REFRIGERANT PIPING

2.6 REFRIGERANT:

- A. Type shall be provided to suit equipment being served.

2.7 LOCKING ACCESS PORT CAPS

- A. Provide locking cap(s) with multi-key(s) for all refrigerant circuit access ports located outdoors.
- B. Locking caps shall be as manufactured by Win Air Company or comparable acceptable product.

2.8 PROTECTIVE ENCLOSURES

- A. Provide 26 Gauge Steel with a 40-year Valspar Baked on Paint Finish.
- B. All metal construction, no plastic
- C. Tapering ends for easy joining pieces together
- D. Completely adjustable for exact length of coverage
- E. Basis of design PermaCover model HVAC Line Set Cover Kit – Metal Line. Comparable products shall be submittal for approval as a comparable product.

2.9 ENGINEERED WALL SEAL AND INSULATION PROTECTION SYSTEM:

- A. Provide a combined 2-in-1 protection system to be provided and installed for sealing wall penetrations of HVAC refrigerant line and protecting the refrigerant line set piping insulation. System basis of design shall be AIREX Pro-System Kit™ or a comparable acceptable product. The use of a combined sustainable compression gasket and seal system shall meet the requirements of the energy codes, to seal refrigerant line wall penetrations to prevent wall air-leakage, moisture intrusion, weather intrusion, rodent intrusion, vibration control, physical wall damage, when connecting with refrigerant piping or thermal insulated refrigerant piping.
- B. FLEXIBLE PVC PLASTIC COVERS: Provide Flexible PVC Plastic UV/Weather Protective Cover for Pipe Insulation. Basis of design shall be as manufactured by AIREX E-FLEX GUARD™ by Airex Manufacturing Inc. shall be provided and installed, the pipe insulation UV/protective cover shall feature an outdoor industrial grade combined method with molecular bonding and an integral pre-fastening system that allows removable/ reusable use for maintenance and full-enclosure including cut to length capabilities without the use of adhesives as an attachment in any way shape or form including either in the protectors construction or the protectors installation or on any attachment to pipe insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 Section: "Administrative Requirements": Coordination and project conditions.
- B. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.
- C. Verify excavations are to required grade, dry, and not over excavated.

3.2 PREPARATION

- A. Pre-Cleaning:
 - 1. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
 - a. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician's tape.
 - b. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 - c. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 - d. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

3.3 INSTALLATION - INSERTS

- A. Provide inserts for placement in concrete forms.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Hangers, supports, and anchors are specified in Division 23 Section: "Hangers and Supports for HVAC Piping and Equipment."

3.5 INSTALLATION OF VALVING

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Install stop/ball valves:
 - 1. The suction inlet of each compressor, compressor unit, or condensing unit
 - 2. The discharge outlet of each compressor, compressor unit, or condensing unit
 - 3. Each inlet and each outlet of each condenser where more than one condenser is used in parallel.
 - 4. The inlet and outlet of each liquid receiver
 - 5. On each side of strainers and driers
 - 6. In liquid and suction lines at evaporators
 - 7. Elsewhere in accordance with manufacturer's instructions.
- C. Stop/ball valves shall be supported to prevent detrimental stress and strain on the refrigerant piping system.
- D. Stop/ball valves shall be identified where their intended purpose is not obvious.
- E. Install a full sized, 3-valve bypass around each drier.
- F. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
 - 1. Electrical wiring for solenoid valves is specified in Division 26. Coordinate electrical requirements and connections.
- G. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
 - 1. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
 - 2. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
 - 3. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
 - 4. Where external equalizer lines are required, make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
- H. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.6 PIPING APPLICATION

- A. Provide Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Provide Type K, annealed temper copper tubing for 2 inch and smaller without joints, within enclosed areas. Mechanical fittings (crimp or flair) are not permitted.
 - 1. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.

3.7 INSTALLATION OF PIPING

- A. Route piping parallel to building structure and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors.
- E. Install pipe identification
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide access where valves and fittings are not exposed.
- H. Arrange refrigerant piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- I. Flood refrigerant piping system with nitrogen when brazing.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- K. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Insulate piping and equipment
- N. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.
- O. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- P. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- Q. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- R. Provide electrical connection to solenoid valves.
- S. Fully charge completed system with refrigerant after testing.
- T. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- U. Install refrigerant piping in accordance with ASME B31.5.

- V. Size piping and install refrigerant piping, traps, specialties as necessary for a complete and operational system in accordance with equipment manufacturer's recommendations.
- W. General: Install refrigerant piping in accordance with ASHRAE Standard 15 "The Safety Code for Mechanical Refrigeration". Unless specified otherwise by the Section, comply with "Installation of Piping - General" as specified in Division 22 Section; "Pipes and Tubes for Plumbing Piping and Equipment" and Division 23 Section: "Pipes and Tubes for HVAC Piping and Equipment."
- X. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- Y. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- Z. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- AA. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- BB. Insulate suction lines. Liquid lines are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
 - 1. Do not install insulation until system testing has been completed and all leaks have been eliminated.
- CC. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- DD. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- EE. Slope refrigerant piping as follows:
 - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
 - 2. Install horizontal suction lines with 1/2" per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
 - 3. Install traps and double risers and where required in accordance with equipment manufacturer's recommendations to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- FF. Use fittings for all changes in direction and all branch connections.
- GG. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

REFRIGERANT PIPING

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- HH. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- II. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- JJ. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- KK. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- LL. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6" shall be steel; pipe sleeves 6" and larger shall be sheet metal.
- MM. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 07 for special sealers and materials.
- NN. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- OO. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.
- PP. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
 - 1. Install moisture/liquid indicators in lines larger than 2 1/8" OD, using a bypass line.
- QQ. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.
- RR. Install flexible connectors at the inlet and discharge connection of compressors.
- SS. Refrigerant circuit access ports located outdoors shall be fitted with locking-type-tamper-resistance caps.
- TT. Exposed refrigerant pipe in open spaces shall not be installed less than 7 feet 3 inches above the finished floor.
- UU. Refrigerant piping that penetrates two or more floor/ceiling assemblies shall be installed in a fire rated shaft enclosure.
- VV. Refrigerant piping located in concealed locations where tubing is installed in studs, joists, rafters, or similar member spaces, and located less than 1-1/2 inches from the nearest edge of the member shall be continuously protected by shield plates. Protective shield plates having a minimum thickness of 0.0575 inch (16 gage) shall cover the area of the pipe plus the area extending not less than 2 inches beyond both sides of the pipe.

REFRIGERANT PIPING

3.8 INSTALLATION - REFRIGERANT SPECIALTIES

- A. Refrigerant Liquid Indicators:
 - 1. Install line size liquid indicators in main liquid line downstream of condenser.
 - 2. When receiver is provided, install line size liquid indicators in liquid line downstream of receiver.
 - 3. Install line size liquid indicators downstream of liquid solenoid valves.
- B. Refrigerant Valves:
 - 1. Install service valves on compressor suction and discharge.
 - 2. Install gage taps at compressor inlet and outlet.
 - 3. Install gage taps at hot gas bypass regulators, inlet and outlet.
 - 4. Install check valves on compressor discharge.
 - 5. Install check valves on condenser liquid lines on multiple condenser systems.
 - 6. Install refrigerant charging valve in liquid line between receiver shut-off valve and expansion valve.
- C. Strainers:
 - 1. Install line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, install single main liquid-line strainer.
 - 3. On steel piping systems, install strainer in suction line.
 - 4. Install shut-off valves on each side of strainer.
- D. Install pressure relief valves on ASME receivers. Install relief valve discharge piping to terminate outdoors.
- E. Filter-Dryers:
 - 1. Install permanent filter-dryers in low temperature systems.
 - 2. Install permanent filter-dryer in systems containing hermetic compressors.
 - 3. Install replaceable cartridge filter-dryer vertically in liquid line adjacent to receivers.
 - 4. Install replaceable cartridge filter-dryer upstream of each solenoid valve.
- F. Solenoid Valves:
 - 1. Install in liquid line of systems operating with single pump-out or pump-down compressor control.
 - 2. Install in liquid line of single or multiple evaporator systems.
 - 3. Install in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.
- G. Refrigerant pipe enclosures:
 - 1. All refrigerant piping shall be protected by locating within building elements or protective enclosures

2. Provide protective enclosures where piping is exposed within the building or outside on grade/roof.
3. Protective enclosures are not required:
 - a. Where piping is installed without ready access or located more than 7 feet 3 inches above the finished floor
 - b. Where located within 6 feet of the refrigerant unit or appliance
 - c. Where located in a machinery room per IMC 1105.

3.9 CONSTRUCTION

A. Pipe Joints:

1. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
 - a. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
 - b. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.
2. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.
3. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

B. Equipment Connections:

1. The Drawings indicate the general arrangement of piping and fittings.
2. Install piping adjacent to machine to allow servicing and maintenance.

3.10 REFRIGERANT PIPING SYSTEMS

A. Inspect, test and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI, "Refrigerant Piping and Heat Transfer Components", 2001, and as follows:

1. All refrigerant tubing shall be tested before tube insulation is applied.
2. Note: The use of compressed air for pressure testing refrigerant tubing will not be permitted.
3. Refrigerant relieve valves, if installed, shall be removed prior to pressure testing and shell openings plugged. After system is tested and found to be completely tight, relief valves shall be reinstalled prior to system evacuation.
4. Each tubing system shall be pressure tested with dry nitrogen. Leaks shall be repaired by removing and remaking the defective joint. No caulking will be permitted. After repair of leaks, system shall be retested and provided tight.
5. Tubing shall be tested per refrigerant manufacturer's recommendations. Tubing shall be tested at a minimum of 550 psig on the high side and on the low side. Do not exceed manufacturer recommendations.
6. Repair leaking joints using new materials, and retest for leaks.

REFRIGERANT PIPING

3.11 FIELD QUALITY CONTROL

- A. Division 01 Section: "Quality Requirements and Execution and Closeout Requirements": Field inspecting, testing, adjusting, and balancing.
- B. Test refrigeration system in accordance with ASME B31.5 and International Mechanical Code section 1110.
- C. Repair leaks.
- D. Retest until no leaks are detected.

3.12 ADJUSTING AND CLEANING

- A. Verify actual evaporator applications and operating conditions, and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Clean and inspect refrigerant piping systems in accordance with industry standards.
- C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.13 ENGINEERED WALL SEAL AND INSULATION SYSTEM

- A. The wall seal outlet shall be comprised of an elastomeric sleeve and stainless steel clamp. The connecting refrigerant lines exposed to weather shall be thermal insulated. All pipe insulation material (whether it is exterior surface coated or non-coated) shall be completely covered and protected from sunlight, moisture, equipment maintenance, wind, snow, ice, rodent damage, physical damage, and shall provide shielding from solar radiation that can cause degradation of the material.

3.14 FLEXIBLE PVC PLASTIC COVERS:

- A. All pipe insulation material (whether it is exterior surface coated or non-coated) must be completely covered and protected. THE USE OF ANY ADHESIVES IS NOT PERMITTED FOR THIS APPLICATION. Insulation Protector shall be tested and meet the following testing: ASTM E 96 (Vapor Transmission of Materials), ASTM G 153 (Carbon Arc Light Exposure – Accelerated Weathering), ASTM D 412 (Tensile Strength after UV Exposure and Water Immersion), ASTM 570 (Water Absorption of Plastics), ASTM E 84 (Surface Burning Characteristics of Building Materials), ASTM G 21 (Fungal Growth). UV/Protector Pipe Insulation Material shall meet Class II vapor retarder per ASTM E 96 (vapor/moisture permeability test) "1 perm or less". Wrapping Tape or Adhesive Tape shall not be permitted as per energy codes.

END OF SECTION

REFRIGERANT PIPING

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**SECTION 23 30 00
HVAC AIR DISTRIBUTION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specifications, apply to this section, and all sections of Division 23.

1.2 SUMMARY

- A. Section includes:

1. Duct Materials
2. Duct Applications
3. Duct Systems Fabrication
 - a. General
 - b. Crossbreaking or Cross Beading
 - c. Rectangular Duct Fittings
 - d. Transverse Duct Connection
 - e. Manufactured Turning Vanes
 - f. Round Branch Fittings
 - g. Spin-in Fittings
 - h. Splitter Dampers
 - i. Hangers and Supports
 - j. Sealing Materials
 - k. Casings
4. Duct Sound Lining
5. Single Wall Spiral Round Ducts
6. Flexible Duct
7. Flexible Duct Connectors
8. Ductwork Accessories
 - a. Backdraft Dampers
 - b. Manual Volume Control Dampers
 - c. Duct Access Doors
9. Louver Blank-Off Panels

- B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 23 Section: "HVAC Insulation": Execution requirements for insulation as specified by this Section.
2. Division 23: Common Motor Requirements for HVAC Equipment: Product requirements for fan powered terminal units for placement by this section.

3. Division 23 Section: "Instrumentation and Control for HVAC": Product requirements for connection and control of Combination Smoke and Fire Dampers for placement as specified by this Section.
4. Division 26 Section: "Low Voltage Electrical Power Conductors and Cables": Requirements for electric wiring and connection to devices and units as specified by this Section.
5. Division 26 Section: "Raceways and Boxes for Electrical Systems": Requirements of conduits and boxes housing electrical wiring and connections as specified by this Section.

1.3 REFERENCES

(Unless otherwise noted, references apply to "latest editions.")

- A. Abbreviations and Acronyms
 1. ATC – Automatic Temperature Control
 2. BMS – Building Management System
 3. LACS – Laboratory Airflow Control System
 4. UBC – Usage Based Controls
 5. VAV – Variable Air Volume
- B. American National Standards Institute
 1. ANSI/ASHRAE ® 135-2001: BACnet – A Data Communication Protocol for Building Automation Systems (including standard and all published addenda).
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 1. ASHRAE Handbook - Fundamentals.
 2. ASHRAE 52.1 – Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
 3. ASHRAE 70 – Method of Testing for Rating the Performance of Air Outlets and Inlets.
 4. ASHRAE/ANSI 130, Methods for Testing Air Terminal Units.
- D. American Welding Society:
 1. AWS D1.1 - Structural Welding Code - Steel.
 2. AWS D1.2 - Structural Welding Code - Aluminum.
 3. AWS D9.1 - Sheet Metal Welding Code.
- E. ASTM International:
 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 2. ASTM A90 - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

4. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 5. ASTM A568 - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 6. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 7. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 8. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 9. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 10. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 11. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 12. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 13. ASTM E1 – Standard Specification for ASTM Thermometers.
 14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. National Fire Protection Association:
1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
 2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
 3. NFPA 92A – Recommended Practice for Smoke-Control Systems.
 4. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- G. International Code Council:
1. International Energy Conservation Code (IECC).
 2. International Mechanical Code (IMC).
- H. Sheet Metal and Air Conditioning Contractors' National Association:
1. SMACNA 016 - HVAC Air Duct Leakage Test Manual.
 2. SMACNA 1767 - Kitchen Ventilation Systems and Food Service Equipment Guidelines.
 3. SMACNA 1884 - Fibrous Glass Duct Construction Standards.
 4. SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible.
 5. SMACNA "Duct Cleanliness for New Construction Guidelines".
- I. Underwriters Laboratories Inc.:
1. UL 181 - Factory-Made Air Ducts and Connectors.
 2. UL 181A - Closure Systems for Use With Rigid Air Ducts.
 3. UL 555 – Standard for Safety for Fire Dampers.

4. UL 555C – Standard for Safety for Ceiling Dampers.
5. UL 555S – Standard for Safety for Smoke Damper.
6. UL 586 – High –Efficiency Particulate, Air Filter Units.
7. UL 867 – Electrostatic Air Cleaners.
8. UL 900 – Air Filter Units.
9. UL 1978 - Grease Ducts.

J. American Refrigeration Institute:

1. ARI 880 – Performance Rating of Air Terminals.
2. ARI 885 – Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
3. ARI 850 – Commercial and Industrial Air Filter Equipment.

K. National Electrical Manufacturers Association:

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

L. Air Movement and Control Associations:

1. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters.

1.4 DEFINITIONS OF SEAMS AND JOINTS FOR FIELD FABRICATED DUCTWORK

A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:

1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints. Seams also refer to circumferential seams on manufactured fittings.
2. Joints: Joints include girth joints; branch and sub branch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without alteration of system performance, including increasing the system total pressure.
- B. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission of Architect/Engineer.

- C. Size round ducts installed in place of rectangular ducts according to ASHRAE Handbook - Fundamentals.

1.6 PREINSTALLATION MEETINGS

- A. Division 01 Section: "Project Management & Coordination": Requirements for pre installation meeting.
- B. Convene minimum two weeks prior to commencing Work of this Section.

1.7 SUBMITTALS

- A. Division 01 Section: "Submittal Procedures": Submitted procedures.
- B. Product data including performance data and manufacturers technical details of construction relative to materials, weights, dimensions of individual components, schedules for each type of air devices, terminal units, etc. (fire dampers, smoke dampers, etc.) with location/designation/size/model number, profiles, accessories and finishes for the following items:
 - 1. Duct Materials
 - 2. Duct Applications and Sealing
 - 3. Duct Systems Fabrication
 - a. General
 - b. Crossbreaking or Cross Beading
 - c. Rectangular Duct Fittings
 - d. Transverse Duct Connection
 - e. Manufactured Turning Vanes
 - f. Round Branch Fittings
 - g. Spin-in Fittings
 - h. Splitter Dampers
 - i. Hangers and Supports
 - j. Sealing Materials
 - k. Casings
 - 4. Duct Sound Lining
 - 5. Single Wall Spiral Round Ducts
 - 6. Ductwork Accessories
 - a. Backdraft Dampers
 - b. Manual Volume Control Dampers
 - c. Duct Access Doors
 - 7. Louver Blank-Off Panels
- C. Maintenance data for volume control devices, fire dampers, smoke dampers and combination fire/smoke dampers, in accordance with Division 23 Section and Division 01.
- D. Test Reports:

1. Indicate pressure tests performed, including date, section tested, test pressure, and leakage rate according to SMACNA 016.
- E. Shop Drawings:
 1. Submit duct fabrication drawings, drawn to scale not smaller than 1/4 inch equals 1 foot, on sheets same size as Contract Drawings, indicating following:
 - a. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other Work.
 - b. Duct layout that further indicates pressure classifications and sizes in plan view; exhaust duct systems that further indicate classification of materials handled as specified in this Section.
 - c. Fittings.
 - d. Reinforcing details and spacing.
 - e. Seam and joint construction details.
 - f. Penetrations through fire-rated and other walls.
 - g. Hangers and supports, including methods for vibration isolation and building and duct attachment.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Manufacturer's Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.
- H. Manufacturer Instructions:
 1. Submit detailed instructions on installation requirements, including storage and handling procedures.
 2. Submit special procedures for glass-fiber ducts.
- I. Qualifications Statements:
 1. Submit qualifications for manufacturer, installer, and licensed professional.
 2. Submit manufacturer's approval of installer.
- J. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.8 CLOSEOUT SUBMITTALS

- A. Division 01 Section: "Contract Closeout Procedures": Closeout Procedures.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data/procedure.

- C. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 23 Section and Division 01

1.9 QUALITY ASSURANCE

- A. Installer: A firm with at least 5 years experience on projects with medium pressure ductwork system, VAV, terminal units, etc. similar to this project.
- B. NFPA Compliance; Comply with:
 - 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems, "for system components.
 - 2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems".
- C. U.L. Compliance; comply with:
 - 1. U.L. Standard 181, Class 1 for flexible ductwork.
 - 2. Furnish labeled fire dampers; in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers" furnish labeled smoke dampers in accordance with UL Standard 555S "Leakage Systems." Furnish duct liner that meets the erosion test as detailed in UL Publication 181.
- D. ARI Compliance; Comply with:
 - 1. Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
- E. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
- F. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual".
- G. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
- H. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
- I. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
- J. SMACNA Compliance: Comply with SMACNA duct construction standards (high, medium and low pressure) latest editions as of date of issue of these specifications.
 - 1. Perform Work according to SMACNA 1884 and 1966.
- K. Dampers tested, rated and labeled in accordance with the latest UL requirements.

- L. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- M. Manufacturers shall be regularly engaged in manufacture of components listed herein with characteristics, sizes, capacities and finished required, and whose products have been proven satisfactory in use for a period of not less than five years.

1.10 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.
- C. Welders: AWS qualified within previous 12 months for employed weld types.
- D. Licensed Professional: Professional engineer experienced in design of specified Work and licensed at Project location

1.11 DELIVERY, STORAGE AND HANDLING

- A. Division 01 Section: "Storage and Protection": Product Storage and handling requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- E. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- F. Deliver and store stainless steel sheets on exposed ducts, care shall be taken to minimize scratches and marks caused by manufacturing and installation process.
- G. Deliver diffusers, grilles, registers, transfer air devices, etc. wrapped in factory fabricated fiberboard type containers. Each container on outside of container shall include the equipment tag, type of diffuser, griller, register, transfer etc. or air terminal location to be installed and special handling/stacking requirements. Avoid crushing or bending of containers in any way. Prevent dirt or debris, rain, etc, from entering the container during shipment, handling and storage.
- H. Store equipment and devices in original cartons and protect from weather, construction work traffic, and vandalism. Where possible, all equipment/terminals, etc. shall be stored indoors.

When necessary to store products outdoors, store above grade on pallets or in trailers and enclose with waterproof wrapping to protect from moisture and weather damage.

- I. Protect dampers from damage to operating linkages and blades.
- J. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- K. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.
- L. Covers on all containers shall be removed in time to eliminate the possibility of mold growth due to moisture.

1.12 AMBIENT CONDITIONS

- A. Division 01 Section: "Temporary Facilities and Controls": Requirements for ambient condition control facilities for product storage and installation.
- B. Minimum Conditions: Do not install duct sealant when temperatures are less than those recommended by sealant manufacturer.
- C. Subsequent Conditions: Maintain temperatures during and after installation of duct sealant.

1.13 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.
- B. Indicate field measurements on Shop Drawings.

1.14 COORDINATION

- A. Division 01 Section: "Project Management & Coordination": Coordination and project conditions.
- B. Coordinate Work where appropriate with building control Work.

1.15 WARRANTY

- A. Refer to Division 01 Section: "Contract Closeout Procedures": for product warranties and product bonds.
- B. Furnish five year manufacturer's warranty for ducts and air terminal units.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90.
- B. Steel Ducts: ASTM A568, A1008, or A1011
- C. Aluminum Ducts: ASTM B209 with dimensional tolerances of ANSI Standard H 35; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength. Ductwork shall be constructed in accordance with SMACNA Guidelines for aluminum ductwork.
- D. Fasteners: Rivets, bolts, or sheet metal screws.
- E. Hanger Rod: ASTM A36; galvanized steel continuously threaded.
- F. Reinforcing Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.
- G. Tie Rods: Galvanized steel. 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch, minimum diameter for lengths longer than 36 inches.
- H. General: Furnish and install miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and sizes necessary to comply with duct system requirements, including proper connection of ductwork and equipment.

2.2 DUCT APPLICATIONS AND SEALING

- A. Static-Pressure and Seal Classes: Unless otherwise indicated, construct according to the following:

<u>DUTY</u>	<u>DUCT SYSTEM</u>	<u>SMACNA PRESSURE CLASS (INCHES WG)</u>	<u>GAGE PRESSURE</u>
Outdoor Air	All Outdoor Air Ductwork	2"	Negative

1. Provide 18 gauge minimum duct construction for the first ten (10) feet of supply and return ducts connected to all air handling units. Additionally, provide 18 gauge minimum duct construction for all ductwork located in shafts, including top and bottom elbows/tees.

- B. Duct Sealing:

1. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in “Duct Schedule” Article according to SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible”. All ducts shall be completely sealed.
2. All ducts shall be sealed. As a minimum, seal ducts to the following seal classes according to SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible”:

<u>Type</u>	<u>SMACNA PRESSURE CLASS (INCHES WG)</u>	<u>Positive or Negative Service</u>	<u>Seal Class</u>	<u>Leakage Class</u>
Round Metal	2”	Negative	C	12
Round or Rectangular Metal	2”	Positive	C	6

2.3 DUCT SYSTEMS FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel or aluminum; in accordance with SMACNA 1966 "HVAC Duct Construction Standards," Latest Edition, Tables 2-1 through 2-52, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
 1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
 3. Make allowance for internal duct lining where required.
 4. Determine duct gauges for the longest duct side and use for all 4 sides. Joints and reinforcing requirements apply to the longest duct side.
 5. Reinforce all ducts to prevent buckling, vibration or noise as recommended in the referenced construction standards and as required to suit the installed conditions.
 6. Do not crossbreak duct which will receive rigid insulation covering.
 7. Where tap sizes of divided flow fittings are not indicated, make branch and main connection sizes proportional to their respective air flows and maintain uniform transverse velocities in the fittings.
 8. Make radius elbows and radius tee connection with throat radius equal to or greater than 1-1/2 centerline width of the duct. Use vaned elbows where shown and where radius elbows will not fit the space in all square bends.
 9. Turning vanes shall be the airfoil type with extended trailing edges 36" maximum length. Where longer vanes are required, use 2 or more sets of vanes with intermediate runners securely fastened together.
 10. Bolts, screws, rivet or spot weld reinforcing members securely to the duct on not less than 6" centers.
 11. Where ducts are open ended without grilles, registers or other means of stiffening, reinforce and stiffen the open end with standing seams or an angle frame.

12. Paint all cut ends on galvanized angles, rods and other uncoated surfaces with aluminum paint.
 13. Where ductwork is not painted or otherwise finished, remove all exposed traces of joint sealers, manufacturer's identification and other markings.
 14. Aluminum sheet shall be 3003 H14 alloy or duct sheet, 16,000 PSI minimum tensile strength and capable of being formed to a Pittsburgh lock seam.
 15. Reinforcing members for aluminum ductwork may be galvanized steel or aluminum, unless otherwise indicated. Where aluminum reinforcing is used, size the member in accordance with ASHRAE recommendations to have rigidity equivalent to listed mild steel angle sizes.
 16. Where aluminum ductwork is used, make allowance for increased thermal expansion. Particularly avoid direct contact between aluminum and concrete or masonry walls subject to dampness.
 17. Refer to paragraph 2.26 B for Manual Volume Control Dampers specification.
- B. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gauge or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figures: 4-1 and 4-2, unless they are lined or are externally insulated.
- C. Rectangular Duct Fittings: Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," Latest Edition, Figures 2-1 through 2-10.
1. Slide-on Transverse Joint Connectors
Prefabricated slide-on transverse duct connectors and components will be accepted.
 - a. Duct constructed using prefabricates systems will refer to the manufacturer's guidelines for sheet gauge, intermediate reinforcement size and spacing and proper joint reinforcement(s).
 - b. Manufacturers of prefabricated systems must have duct construction and reinforcement guidelines along with supporting independent leakage and deflection performance testing. Manufacturer's prefabricated systems printed assembly and installation procedures must be adhered to during all phases.
 - c. All components of prefabricated system must be clearly embossed with manufacturer's marking and systems manufacturer clearly identified on all duct labels. No substitution of system components is permitted. Approved Manufacturer: Ductmate Industries or Ward Duct Connectors Incorporated "W.D.C.I."
- D. Transverse Duct Connection System
1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. TDC
 - c. MEZ Industries
 2. Furnish materials in accordance with all applicable codes, standards and local authorities having jurisdiction requirements. Provide SMACNA recommended rigidity class

- connections, interlocking angle and duct edge connection systems with sealant gaskets, cleats, and corner clips.
3. All transverse joints and intermediate reinforcement on rectangular ducts shall be as shown in SMACNA standards. Transverse joints shall be selected consistent with the specified pressure classification, material and other provisions for proper assembly of ductwork.
- a. Slide-on Flanges:
- 1) Description: Add on factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
 - 2) Material: galvanized steel, Stainless 304 or 316, Aluminum, Aluminized, PVC coated, Galvannealed, or Black Iron.
 - 3) Gauge and Shape: For duct constructed using prefabricated systems, refer to the manufacturer's guidelines for sheet gauge, intermediate reinforcement size and spacing, and proper joint reinforcement.
 - 4) Manufacturers or prefabricated systems must provide duct construction and reinforcement guidelines along with independent testing for leakage, deflection, and seismic performance.
 - 5) Independent leakage testing must be for operating pressures of 10 inch wg positive and negative.
 - 6) Manufacturer's prefabricated systems printed assembly and installation procedure must be adhered to at all times.
 - 7) Manufacturer's procedures must include fastener and clean spacing along with details for all system variations including break-away and roofing connections.
 - 8) All manufactured system components must be clearly embossed with manufacturer's name or markings. No substitution of manufacturer's system components is permitted.
- b. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards – Metal and Flexible", Figure 2-2, "Rectangular Duct/Longitudinal Seams", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible".
- c. Elbows, Transitions, Offsets, Branch Connections, and other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards – Metal and Flexible", Chapter 4, "Fittings and Other Construction" for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provision in SMACNA's "HVAC Construction Standards – Metal and Flexible".
4. Casings
- a. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible and construct for operating pressures indicated.
- b. Reinforce access door frames with steel angles tied to horizontal and vertical plenum supporting angles. Furnish hinged access doors where indicated or required for access to equipment for cleaning and inspection. Furnish clear wire glass observation ports, minimum 6 x 6 inch size.
- c. Fabricate acoustic casings with reinforcing turned inward. Furnish 16 gage back facing and 22 gauge perforated front facing with 3/32 inch diameter holes on 5/32

inch centers. Construct panels 3 inches thick packed with 4.5 lb./cu ft minimum glass fiber media, on inverted channels of 16 gage.

E. Manufactured Turning Vanes:

1. Furnish and install single thickness, multiple radius, airfoil steel turning vanes. Static pressure loss for square ducts shall be no more than 20% of velocity head. Turning vanes shall be furnished with a mounting plate to facilitate installation in ductwork. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vane shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instruction. Rails for mounting turning vanes shall have self locking friction fit tabs designed to facilitate proper alignment of vanes. Tab spacing shall be as specified in Figure 4-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Third Edition standard. Rail systems with non-compliant tab spacing shall not be accepted. Acoustical Turning Vane: Shall be used in applications that required quiet operating systems. Mounting rails shall have friction insert tabs that align the vanes automatically. Turning vanes shall be Tuttle and Bailey Model AOOA, Ductmate "PRO-rail," or acceptable comparable product.

F. Round Branch Fittings:

1. Provide take off fittings manufactured with airtight seams using a locking double seam. Units shall be constructed of 26 gauge galvanized steel (minimum). Units shall have a factory installed volume damper with locking spring loaded quadrant. Damper regulator shall be elevated 2" to allow for insulation thickness. Fitting shall be conical type as described on the plans with a base mounting flange secured by a minimum of four sheet metal screws or pop-rivets. See drawings for alternate "Streamline" branch take-off fittings. All High Efficiency Take-Offs, Conicals, and Collars must have a factory applied gasket along all rivets, co-latches, and flange. All fittings shall be constructed from a minimum of 26 gauge steel. All dampered fittings must have low-leakage hardware with closed-end bearings. Manufacturer: Ductmate Industries "GreenSeam Fittings" or acceptable comparable product.

G. Spin-in Fittings

1. Furnish and install spin-in fittings where indicated on the contract drawings, Royal Metal Products Model No. 168 or acceptable comparable product, provide with balancing damper as manufactured by Duro Dyne, Ductmate Industries or acceptable comparable product.
 - a. Material shall be of same construction as duct main.

H. Splitter Dampers

1. Provide splitter dampers in accordance with SMACNA Standards as manufactured by Titus, Hart & Cooley or approved equal. Dampers shall be of steel construction and shall be provided with manual adjusting lever and locking device.

I. Hangers and Supports

1. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
2. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.
 - a. Hangers Installed In Corrosive Atmospheres: Electro galvanized, all thread rod or hot dipped galvanized rods with threads painted after installation.
 - b. Straps and Rod Sizes: Conform with Table 5-1, 5-1M, 5-2 in SMACNA HVAC Duct Construction Standards, Latest Edition, for sheet steel width and gage and steel rod diameters.
3. Duct Attachments: Sheet metal screws, blind rivets, or self tapping metal screws, compatible with duct materials.
4. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 - a. Where galvanized steel ducts are installed, provide hot –dipped- galvanized steel shapes and plates.
 - b. For stainless steel ducts, provide stainless steel support materials.
 - c. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.
5. Aircraft cable hanging system with easy lightweight mechanical adjustment system may be used for hanging HVAC and other mechanical applications. Aircraft cable and mechanical hanger shall have a 5 to 1 safety factor. Manufacturers: Ductmate Industries "Clutcher" Cable Hanging System, Gripple, Inc. Cable Hanger System, Erico CADDY SPEED LINK, or acceptable comparable product.
 - a. Cable hanging systems with adjustable mechanical devices shall be compliant with SMACNA HVAC duct construction standards, and the authority having jurisdiction's requirements.

J. Sealing Materials

1. Joint and seam sealants:
 - a. UL-723
 - b. Maximum flame spread of 0 and maximum smoke development of 0
 - c. Seal to 15" water gauge and meet the requirements of all SMACNA seal classes
 - d. Application method: Brush, spray, or caulk.
 - e. Solid Content: Minimum 68% +/-2%
 - f. Water resistant
 - g. Mold and mildew resistant
 - h. Service: Indoor and outdoor
 - i. Static pressure rating: 15" water gauge
 - j. VOC: 0 g/l
 - k. LEED: Meets LEED v4 requirements or later
 - l. Emissions: Certified compliant under CDPH V1.1 small chamber emissions testing
 - m. Other requirements: Meet FDA, USDA, and EPA standards
 - n. UL 181 B-M listed

- o. Acceptable manufacturers: Design Polymerics DP 1010, Ductmate Industries Proseal, or Hardcast Inc. IG-601 Iron Grip
 - 2. Flanged gasket
 - a. Gasket size: 5/8" x 3/16", no exceptions
 - b. UL 723
 - c. Maximum flame spread of 5 and maximum smoke development of 5
 - d. For use in TDC and TDF flanges
 - e. Mold and mildew resistant
 - f. Solid content: 100%
 - g. Water resistant
 - h. Elongation 600%
 - i. Service temperature: -40F to +245F
 - j. Other requirements: Meet FDA, USDA, and EPA standards
 - k. Acceptable manufacturers: Design Polymerics DP 1040 or Ductmate Industries 440 Butyl gasket tape.
 - 3. Seam sealant
 - a. For use in Pittsburg, button punch, and snap lock seams
 - b. Non-curing and non-shrinking
 - c. Permanently flexible
 - d. Pumpable
 - e. Water resistant
 - f. Service temperature: -40F to +200F
 - g. Acceptable manufacturers: Design Polymerics seam sealant or Ductmate Industries 5511M.

K. Casings

- 1. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible and construct for operating pressures indicated.
- 2. Reinforce access door frames with steel angles tied to horizontal and vertical plenum supporting angles. Furnish hinged access doors where indicated or required for access to equipment for cleaning and inspection. Furnish clear wire glass observation ports, minimum 6 x 6 inch size.
- 3. Fabricate acoustic casings with reinforcing turned inward. Furnish 16 gage back facing and 22 gauge perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb./cu ft minimum glass fiber media, on inverted channels of 16 gage.

2.4 DUCT SOUND LINING

A. Rectangular Ductwork

- 1. Products:
 - a. K-Flex Gray Duct Liner with PSA
 - b. Armacell AP/Coilflex

- 1) Material shall have a density ranging from **3 lb/ft³** (ASTM D1622, ASTM D3575).
 - 2) Material shall have a maximum thermal conductivity (k) of 0.25 Btu-in/hr-ft²-°F @ 75°F mean temperature (ASTM C518, ASTM C177).
 - 3) Material shall have a maximum Water Vapor Transmission rate of 0.10 Perm-in. (ASTM E96, Desiccant Method).
 - 4) Material shall have a minimum sound absorption coefficient (NRC) of 0.50 at a nominal 1" thickness (ASTM C423).
 - 5) Material shall have a flame spread rating not greater than 25 and a smoke developed rating not greater than 50 when tested in accordance with ASTM E84 at a thickness required to attain a minimum 6 R-value.
 - 6) Material shall have a minimum R-value of 6 at a nominal 1 ½" thickness.
 - 7) Application of K-Flex gray duct liner with PSA shall be per manufacturer's recommendations and per SMACNA requirements.
 - 8) Low VOC adhesive to meet South Coast AQMD Rule 1168.
 - 9) Duct liners shall not break away, flake off, or show evidence of delamination at velocities of 10,000 ft/min per ASTM C1071.
- c. Ductmate Industries, Inc. PolyArmor
- 1) Duct liner shall be an engineered nonwoven, thermally bonded Polyester with a smooth and durable FSK facing. Liner shall have a noise reduction coefficient of at least 0.65 and have thermal values greater or equal to an R-4.2 at 1", R-5 at 1 ¼", R-5 at 1 ½", and R-8 at 2" respectively.
 - 2) Polyester liner shall be able to withstand a constant internal temperature up to 250°F, shall be compliant with Greenguard Environmental Institute, and contain zero VOCs per ASTM D5116. Liner shall comply with all applicable standards including ASTM E84, ASTM C518, ASTM G-21, NFPA 90A and 90B, and UL 181.
 - 3) Polyester duct liner shall be attached using a nonflammable, low VOC water based adhesive. When applicable, apply a nonflammable, low VOC water based lagging adhesive to the exposed leading edge of the insulation. Install fasteners per SMACNA HVAC Duct Liner installation instructions.
 - 4) Polyester duct liner shall be installed per section 7.4 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible", Third Edition unless otherwise specified.
- B. Round/Oval Ductwork: Insulation material shall be a flexible, closed-cell or conformable, elastomeric insulation in sheet form as manufactured by Armacell: AP Spiralflex or a comparable acceptable product. This product shall meet the requirements as defined in ASTM C 534, Grade 1 Type II, "Specification for performed elastomeric cellular thermal insulation in sheet and tubular form".
1. Insulation materials shall be manufactured without the use of CFC's, HFC's or HCFC's. It is also formaldehyde-free, low VOCs, fiber free, dust free and resists mold and mildew.
 2. The insulation material shall conform to meet the requirements as defined in ASTM C 1534, Standard "Specification for Flexible Polymeric Foam Sheet Insulation Used as a Thermal and Sound Adsorbing Liner for Duct Systems"
 3. Materials 1" thickness and below, shall have a flame spread index of less than 25 and a smoke developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming

- particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.
4. Materials shall have a maximum water absorption rate of 0/2% (% by volume), when tested in accordance with ASTM C 209.
 5. The material shall be manufactured under an independent third party supervision testing program covering the properties for fire performance, thermal conductivity and water vapor transmission.
 6. Materials shall be approved for air plenums.
 7. Materials shall meet NFPA 90A, NFPA 90B and UL 181 Class 1 specification.
 8. Materials shall meet ASTM C 411. Materials to perform up to 250°F.
 9. Pertinent Duct Lining Specification Compliance.
 10. Sound lining shall adhere to:
 - a. ASTM C 1071 – Erosion Resistance.
 - b. ASTM G 21 – Fungi Resistance.
 - c. ASTM C 1338 – Fungi Resistance.
 - d. ASTM G 22 – Bacterial Resistance.
 - e. ASTM C 665 – Non Corrosiveness and no objectionable odors.
 - f. NRC rating 0.40 – Test Method ASTM C 423 with ASTM E 795 Type A Mounting.
 11. Sound lining shall be dust free and fiber free. Non particulating.
 12. AP Spiralflex shall be applied to the inside of round ducts according to the installation guide written specifically for the AP Spiralflex.

2.5 SINGLE WALL SPIRAL ROUND DUCTS

- A. Fabrication Requirements: All round duct shall meet SMACNA “HVAC Duct Construction Standards – Metal and Flexible” – current edition.
- B. Manufacturers:
 1. McGill AirFlow Corporation
 2. Semco Incorporated
 3. Tangent Air Corp.
 4. Spiral Mfg. Co., Inc.
 5. Eastern Sheet Metal, LLC
 6. TNT Manufacturing
 7. Linx Industries.
 8. Ductmate Industries
- C. Furnish materials in accordance with all applicable codes, standards and local authorities having jurisdiction requirements.
- D. Transverse Joints: Select joint types according to SMACNA “HVAC Duct Construction Standards – Metal and Flexible” – current edition. Utilize Figure 3-2 – “Transverse Joints - Round Duct”.
 1. Transverse Joints larger than 60” diameter – Flanged.

- a. Unexposed Duct 3 inch to 30 inch Diameter: Round duct connects with a one-piece interior slip coupling at least two gages heavier than duct wall, beaded at center and fasted to duct with screws. Seal joint with an approved sealant applied continuously around both ends of coupler prior to assembling and after fastening.
 - b. All Exposed Duct and Unexposed Duct 30 inch to 72 inch Diameter. Three-piece, gasket flanged joint consisting of two internal flanges, with integral mastic sealant, and one external closure ring, for connecting the internal flanges and securing the closed cell neoprene gasketing in place.
- E. Longitudinal Seams: Select joint types according to SMACNA "HVAC Duct Construction Standards – Metal and Flexible" – current edition. Utilize Figure 3-1 – "Seams – Round Duct and Fitting".
- 1. Round duct larger than 72" in diameter shall have butt-welded longitudinal seams.
- F. All round duct in excess of 1" W.G. positive or negative shall be spiral wound.
- G. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.
- H. Construct duct with the following minimum gauges:

Diameter	Gauge
2 inches to 14 inches	26
15 inches to 26 inches	24
27 inches to 36 inches	22
37 inches to 50 inches	20
51 inches to 60 inches	18

- I. Construct fittings with the following minimum gauges:

Diameter	Gauge
2 inches to 14 inches	24
15 inches to 26 inches	22
27 inches to 36 inches	20
37 inches to 60 inches	18
61 inches to 84 inches	16

2.6 FLEXIBLE DUCT

- A. Air Devices to Supply/Return Branch Ducts:
- 1. Flexible ductwork shall be Atco UPC #036 or comparable acceptable product, UL listed for Class 1 Air Ducts, Standard 181. Ducts shall be rated for positive pressure of 10" W.G. and negative pressure of 2" W.G. per UL 181.
 - 2. Description:

- a. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helical-wound spring steel wire.
 - b. Insulation: Fiberglass.
 - c. Vapor Barrier Film: polyethylene
 - d. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - e. Maximum Velocity: 4,000 fpm
 - f. Temperature Range: Minus 20 to plus 210 degrees F
3. Limit flexible duct 6' maximum. Install flexible ducts, using all recommended fittings, couplings and accessories. Support ducts with wide straps spaced so that horizontal runs do not sag more than 3" in 3'. Cover with duct tape and fasten with duct strap clamps. 180° bends in flexible duct are prohibited.

B. Flexible Duct Elbow Supports:

1. Flexible Duct Elbow Supports shall be Build Right Products-Flex® or comparable acceptable product.
 - a. Universal-mount 1-piece, fully adjustable, radius-forming brace to support 4-inch through 16-inch diameter flexible air ducts.
 - b. Classified: UL 2043.
 - c. Material: 100 percent recycled copolymer polypropylene.
 - d. Support Frame Radius: 8 inches.
 - e. Compliance for Flexible Duct Radius:
 - 1) SMACNA HVAC Duct Construction Standards.
 - 2) ASHRAE Advanced Energy Design Guides.
 - 3) ADC Flexible Duct Performance and Installation Standards.

2.7 FLEXIBLE DUCT CONNECTORS

- A. Indoor Installation: UL listed fire retardant neoprene or vinyl-coated woven fiberglass fabric. Minimum density 30 oz./sq. yd. Rated to constant maximum temperature of 200 deg. F.
1. Acceptable Manufacturers, subject to compliance with requirements:
 - a. VentFabrics, Inc, model "Ventglas".
 - b. Duro-Dyne Corp, model 10012 MF6N Specification Grade Neoprene, Super Metalfab."
 - c. Ductmate Industries, Inc., model PROflex.

2.8 DUCTWORK ACCESSORIES

A. Backdraft Dampers

1. General
 - a. Provide and install factory fabricated backdraft dampers suitable for horizontal or vertical installations.

- b. Frame construction shall be based upon individual application and based on manufacturer's installation instructions for each damper assembly.
- c. Mill finish is standard unless specified otherwise.
- 2. Manufacturers
 - a. Subject to compliance with requirements, provide dampers of one of the following:
 - 1) Ruskin Manufacturing.
 - 2) American Warming and Ventilating.
 - 3) Greenheck Corporation.
 - b. Model numbers and features listed below are based on Ruskin Manufacturing.
- 3. Light to Medium Duty Backdraft Damper (1000 to 1500 FPM maximum velocity)
 - a. Frame: 6063T5 extruded aluminum, 0.090" wall thickness, mitered corners.
 - b. Blades: (1000 FPM maximum velocity) - Ruskin BD2/A1, 0.025" formed aluminum, extruded vinyl edge seals. (1500 FPM maximum velocity) - Ruskin BD2/A2, 6063T5 extruded aluminum, 0.050" wall thickness, extruded vinyl edge seals.
 - c. Bearings: Synthetic.
 - d. Linkage: Concealed in frame.
 - e. Temperature limits: -40°F to +200°F.
 - f. Operational pressures: BD2A1 blades open at 0.03 in. wg. and are fully open at 0.10 in. wg. BD2A2 blades open at 0.10 in. wg. and are fully open at 0.15 in. w.g.
 - g. Accessories:
 - 1) Rear mounted bird screen.
 - 2) Kynar finish.
 - 3) Baked enamel finish.
 - 4) (Color and finish selection by Architect/Owner)

B. Manual Volume Control Dampers:

- 1. General:
 - a. Provide factory-fabricated volume-control dampers, complete with required hardware and accessories. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft. All dampers shall be provided with shaft seals to prevent air leakage.
 - b. Where damper or splitter control rods extend through finished walls or ceilings, terminate rods in approved access box equal to Young No. 1 surface mounted quadrant regulator.
 - c. All splitter rods shall be provided with Young No. 656-3/8" or 659 – 1/2" end bearings using two (2) bearings per splitter damper.
 - d. All ducts larger than 12 x 12 shall be provided with opposed blade dampers.
 - e. For square ductwork smaller than 12x12 utilize the following damper:
 - 1) Control dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules.

- 2) Damper blades shall be 16 ga. Galvanized steel 3V type with three longitudinal grooves for reinforcement. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow and operation in either direction through the damper (blades that are non-symmetrical relative to their axle pivot point or utilize blade stops larger than ½ inch are unacceptable). Blade seals shall be TPE. Linkage shall be blade-to-blade concealed in jamb (out of the airstream) to protect linkage and reduce pressure drop and noise.
- 3) Damper frame shall be 16 ga. galvanized steel formed into a structural hat channel shape with reinforced corners to meet 11 ga. criteria. Bearings shall be corrosion resistant, permanently lubricated, synthetic (acetal) sleeve type rotating in extruded holes in the damper frame for maximum service. Axles shall be square and positively locked into the damper blade. Jamb seals shall be flexible stainless steel compression type to prevent leakage between blade end and damper frame.
- 4) The damper manufacturer's submittal data shall certify all air leakage and air performance pressure drop data in licensed in accordance with the AMCA Certified Rating Program for Test Figures 5.2, 5.3 and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D.
- 5) Basis of design shall be Greenheck model VCD-23, comparable products as manufactured by Ruskin or American Warming and Ventilation may be submitted for consideration.
- f. For Round Ductwork 12" in. Diameter and Smaller Utilize the following damper:
 - 1) Round control dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules. Dampers shall consist of 20 ga. galvanized steel frame, blades fabricated from 20 ga. galvanized steel, and ½ in. dia. plated steel axles turning in bronze bearings and EPDM blade seals.
 - 2) Damper manufacturer's printed application and performance data including pressure, velocity, and temperature limitations shall be submitted for approval velocities to 3,000 fpm temperatures to 250°F and leakage to 4cfm/ft² @ 1 in. wg.
 - 3) Testing and rating to be in accordance with AMCA Standard 500-D.
 - 4) Basis of design shall be Greenheck model VCDR-53, comparable products as manufactured by Ruskin or American Warming and Ventilation may be submitted for consideration.
2. Manufacturers:
 - a. Subject to compliance with requirements, provide dampers of one of the following:
 - 1) Ruskin Manufacturing.
 - 2) American Warming & Ventilating
 - 3) Greenheck Corporation
 - b. Model numbers and features listed below are based on Ruskin Manufacturing.
3. Standard Duty Manual Volume Dampers:
 - a. Frame: 16 gauge galvanized steel structural hat channel with reinforced tabbed corners.
 - b. Blades: 6" wide, single skin, 16 gauge galvanized steel with three longitudinal grooves for reinforcement.

- c. Linkage: Concealed in frame, out of the airstream.
 - d. Axles: ½" plated steel hex, positively locked.
 - e. Bearings: Molded synthetic, corrosion resistant.
 - f. Blade seals: PVC coated polyester fabric mechanically locked into the blade edge. Jamb seals shall be flexible metal between blade and frame.
 - g. Control shaft: ½" diameter, removable steel shaft.
 - h. Maximum system velocity: 1500 FPM.
 - i. Temperature range: -25°F to +180°F.
 - j. Maximum system pressure:
 - 1) 48" width = 2.5 in. wg.
 - 2) 36" width = 3.0 in. wg.
 - 3) 24" width = 4.0 in. wg.
 - 4) 12" width = 5.0 in. wg.
 - k. Selection based on Ruskin Model No. CD36.
 - l. Application: Parallel blade for mixing air streams and exhaust air duty. Opposed blade for outdoor air ductwork upstream of air monitoring station and adjacent to intake louvers suitable for horizontal or vertical installations.
- C. Furnish and install access doors and/or panels in high and low pressure ducts, where indicated or required to provide access for control devices, including but not limited to; control dampers, fire dampers, smoke dampers, airflow monitoring stations, etc.
- 1. Access doors in low velocity ducts shall be equal to Prefco CAD-101 or Ductmate "Square Framed Access Doors." Doors shall have galvanized steel frame, with 1" thick, 1-1/2 pcf fiberglass insulation with 24 gauge galvanized steel inner and outer panels. Doors shall be furnished with cam locks.
 - 2. Doors shall be rated for installation in duct systems with pressures up to 8 in w.g. Where required for fire dampers, doors shall be furnished as a factory fabricated unit along with extended sleeve and fire damper (installed downstream of fire damper). Frame shall be 20 gauge galvanized steel with reinforced corners. Doors shall be 20 gauge galvanized steel sheet with 1" inch thick foil faced duct liner insulation, sandwiched to 22 gauge perforated inner line. Door panels shall have spring clips designed to relieve a minimum of 150 cfm at 2 ½" negative. Panels shall be: 10" x 10" on ducts less than 12" diameter; 12" x 18" on ducts from 12" to 24" diameter; and 18" x 18" on ducts from 26" to 36" diameter.
 - 3. Systems 4" w.g. and above shall utilize a sandwich-type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Third Edition. Manufacturer: Ductmate Industries "Sandwich" style door or acceptable comparable product.
 - 4. Grease exhaust duct doors shall be grease and air tight, UL 1978 listed, meet NFPA 96 standards and all mechanical codes. Grease duct access doors can be sandwich type or with a weld on frame, with/without hinge. Manufacturer: Ductmate Industries "Ultimate" style door or acceptable comparable product.
 - 5. All grease duct access doors used shall be accompanied by independent testing in conjunction with each manufacturer's respective wrap system for high temperature applications.

2.9 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in a through-penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
 - 2. "Pensil 851"; General Electric Co.
 - 3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - 4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - 5. "RTV 7403"; General Electric Co.

2.10 LOUVER BLANK-OFF PANELS

- A. Provide blank off panels over unused portions of exterior louvers. Blank off panels shall be 1" air enterprises, Inc. Panel shall be caulked and sealed and shall be attached to aluminum angle frames to provide a neat weathertight enclosure. Paint panels per Architect's directive.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 Section: "Contract Closeout Procedures": Requirements for installation examination.
- B. Verify sizes of equipment connections before fabricating transitions.
- C. Verify rated walls are ready for fire damper installation.
- D. Verify ducts and equipment installations are ready for accessories.
- E. Verify ductwork is ready for air terminal installation.
- F. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement

3.2 PREPARATION

- A. Division 01 Section: "Contract Closeout Procedures": Requirements for installation preparation.
- B. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- C. Install temporary closures of metal or taped PE on open ductwork to prevent construction dust from entering ductwork system.

3.3 DUCT INSTALLATION, GENERAL

- A. Metal Ducts: Install in accordance with SMACNA 1966 Duct Construction Standards – metal and flexible.
- B. Glass-Fiber-Reinforced Ducts: Comply with SMACNA 1884.
- C. Insulated Flexible Duct Fittings:
 - 1. Join each flexible duct section to main trunk duct through sheet metal fittings.
 - 2. Material: Galvanized steel.
 - 3. Equip fittings with factory-installed volume damper having positive locking regulator.
 - 4. Provide insulation guard with fittings installed in lined ductwork.
- D. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
- E. Install ducts with the fewest possible joints.
- F. Install louvers and accessories complete with mounting frames as indicated on the drawings. Coordinate all rough opening requirements with all trades prior to fabrication or procurement of any penetrations.
- G. Make all penetrations in exterior walls watertight and weatherproof in accordance with manufacturer's specific installations instructions.
- H. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- I. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- J. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- K. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

- L. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- M. Install insulated ducts with 1-inch clearance outside of insulation.
- N. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- O. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- P. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- Q. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-½ inches.
- R. Outdoor Ductwork: Protect ductwork and ductwork supports, linings, and coverings from weather.
- S. Seam and Joint Sealing:
 - 1. General: Seal duct seams and joints as follows:
 - a. Seal all transverse joints, longitudinal seams, and duct penetrations.
 - 2. Seal externally insulated ducts prior to insulation installation.
- T. Connections:
 - 1. General: Installation specified is for conventional connections not exposed to the weather, high heat, or corrosive agents.
 - 2. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section: "HVAC Distribution."
 - 3. Branch Connections: Comply with SMACNA "HVAC Air Duct Construction Standards," Figures 2-7 and 2-8.
 - 4. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
 - 5. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.
 - 6. Thermometers and controllers: Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.
- U. Adjusting and Cleaning:
 - 1. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section: "TESTING, ADJUSTING, AND

BALANCING for HVAC” for requirements and procedures for adjusting and balancing air systems.

2. Vacuum duct systems prior to final acceptance to remove dust and debris.
3. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent dust from entering ductwork system.

V. Duct Liner Application

1. Adhere insulation with 90% adhesive coverage with mechanical pin fasteners.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.
6. Follow liner manufacturer’s installation instructions.

W. Installation of Flexible Duct Elbow Supports

1. Install flexible duct elbow supports in accordance with manufacturer’s instructions.
2. Install flexible duct elbow supports over outer jacket of flexible ducts to form smooth, 90-degree ends to eliminate flexible duct kinks and airflow restrictions.
3. Make bends in flexible ducts with minimum of 1-duct diameter centerline radius.
4. Install flexible duct elbow supports at flexible duct 90-degr bends at following locations:
 - a. HVAC equipment with round inlets and outlets.
 - b. Flexible ducts used as elbows.
 - c. As indicated on the Drawings.

3.4 LEAK TESTING AIR DISTRIBUTION AND DUCT SYSTEMS

A. Duct Leak Testing:

1. Test the entire ductwork air distribution system.
2. Disassemble, reassemble, and seal segments of systems to accommodate leak testing and for compliance and test requirements.
3. Prior to installing insulation, conduct tests in accordance with SMACNA HVAC air duct leakage testing procedures of reach section of the system. If pressure classifications are not indicated, test entire system at the maximum system operating pressure. Do not pressurize systems above the maximum design operating pressure.
4. Determine leakage from entire system or from each section of the system being tested by relating leakage to the surface area of the test section.
5. Maximum Allowable Leakage: As described in SMACNA HVAC Air Duct Leakage Test Manual “latest edition”. Comply with requirements for leakage listed in Division 23 Section: “Air Distribution” – Duct Applications and Sealing.
6. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

7. Record leakage testing results on forms from the SMACNA HVAC Air Duct Leakage Test Manual, "latest edition". Submit results within one week of testing.

3.5 FIRESTOPPING

- A. All fire stopping shall be applied in accordance with manufacturers published data and in compliance with UL systems application requirements.
- B. Firestopping shall not be applied until all sleeves are permanently secured in place and ductwork successfully tested air tight.
- C. Application of firestopping shall be in accordance standard UL directory details, provided by the manufacturer, for the specified wall type as shown on the drawings. Each individual detail of the UL system shall be application specific for duct size, duct construction, insulation application, wall construction and wall rating as indicated by the drawings or specifications.

3.6 HANGERS AND SUPPORTS

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 5-1 through 5-4 and Figures 5-1 through 5-11.
- B. Fabricate and support ducts according to SMACNA 1884 and 1966.
- C. Threaded Rods: Provide double nuts and lock washers.
- D. Building Attachments:
 1. Provide concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 2. If possible, install concrete inserts before placing concrete.
 3. Powder-Actuated Concrete Fasteners:
 - a. Use only for slabs more than 4 inches thick.
 - b. Install after concrete is placed and completely cured.
 - c. Do not use powder-actuated concrete fasteners for seismic restraints.
- E. Hanger Spacing:
 1. Comply with SMACNA 1884 and 1966.
 2. Install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
 3. Extend strap supports down both sides of ducts and turn under bottom at least 1 inch.
 4. Secure hanger to sides and bottom of ducts with sheet metal screws.
- F. Hangers Exposed to View: Provide threaded rod and angle or channel supports.

G. Vertical Ducts:

1. Support with steel angles or channel secured to sides of duct with welds, bolts, sheet metal screws, or blind rivets.
2. Support at each floor and at maximum intervals of 16 feet.

H. Upper Attachments:

1. Attach to structures.
2. Selection and Sizing: Provide pull-out, tension, and shear capacities as required for supported loads and building materials.

I. Penetrations:

1. Avoid penetrations of ducts with hanger rods.
2. If unavoidable, provide airtight rubber grommets at penetrations.

J. Domestic Clothes Dryer Exhaust Ducts shall be supported at 4-foot intervals and secured in place.

3.7 DAMPERS, GENERAL:

- A. Provide access to damper components for maintenance of linkage, adjustments and visual inspection.
- B. All dampers shall be installed with their flange outside of the airstream.
- C. Coordinate access to damper with all trades.
- D. Coordinate motor operated damper requirements with Division 23 Section: "Instrumentation and Control for HVAC."
- E. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner material.
- F. Make all adjustments to dampers for proper operation. Backdraft dampers shall be set by the Balancing Contractor upon final system adjustment.
- G. Install balancing dampers on duct take-off to diffusers and grilles and registers, regardless of whether dampers are specified as part of diffuser, or grille and register assembly.

3.8 CLEANING

- A. Division 01 Section: "Construction Cleaning": Requirements for cleaning.
- B. Clean new and existing duct system and force air at high velocity through duct to remove accumulated dust.

- C. To obtain sufficient airflow, clean one half of system completely before proceeding to other half.
- D. Vacuuming:
 - 1. Clean duct systems with high-power vacuum machines.
 - 2. Install access openings into ductwork for cleaning purposes.
- E. Protect sensitive equipment with temporary filters or bypass during cleaning.

END OF SECTION

SECTION 23 81 29
VARIABLE REFRIGERANT FLOW SPLIT SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section, and the other Sections of Division 23.

1.2 SUMMARY

- A. Section includes:
 - 1. Variable refrigerant Flow Split System Heat Pump Units.
 - a. Air cooled
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 23 Section: "Mechanical Insulation" – Insulation materials, thickness, jacketing, etc...
 - 2. Division 23 Section: "Refrigerant Piping": Piping and appurtenances related to system.
 - 3. Division 23 Section: "Air Distribution Systems": Flexible connections.
 - 4. Division 26 Section: "Low voltage Electrical Power Conductors & Cables": Requirements for electrical wiring and cable connections for units specified in this section.
 - 5. Division 26 Section: "Raceways and Boxes for Electrical Systems": requirements for conduits and boxes housing electrical wiring and electrical connections specified in this section.

1.3 REFERENCES

(Unless otherwise noted, references listed below and throughout this specification section apply to "latest edition")

- A. Air-Conditioning Heating, and Refrigeration Institute:
 - 1. AHRI 1230
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 62.1 – "Ventilation For Acceptable Indoor Quality".
 - 2. ASHRAE 15 – "Safety Standard for Refrigeration Systems".
 - 3. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

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- 4. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. ASTM International:
 - 1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
- D. American National Standards Institute/Underwriting Laboratories:
 - 1. ANSI/UL 1995 - Heating and Cooling Equipments and bear the Listed Mark.
- E. ASCE – 7 – Minimum Design Loads for Buildings and other structures.
- F. National Fire Protection Association:
 - 1. NFPA 70 – National Electric Code
 - 2. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
- G. Nationally Recognized Testing laboratory NRTL
- H. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
- I. Underwriters Laboratories Inc:
 - 1. UL-508 - Industrial Control Equipment

1.4 SUBMITTALS

- A. Division 01 Section: “Submittal Procedures”: Submittal Procedures.
- B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- C. Product Data: Submit data indicating:
 - 1. Cooling and heating capacities.
 - 2. Dimensions.
 - 3. Weights.
 - 4. Rough-in connections and connection requirements.
 - 5. Duct connections.
 - 6. Electrical requirements with electrical characteristics and connection requirements.
 - 7. Controls.
 - 8. Accessories.
- D. If basis of design is not submitted or comparable acceptable product is not submitted, the substituted manufacturer shall provide all required design and equipment modifications for a

complete and operable system that meets the performance requirements indicated in the contract documents.

1. If a substituted manufacturer's system is provided, the contractor shall be responsible for all revisions to design and construction scope required by all trades including but not limited to piping, ductwork, equipment, controls, electrical power, architectural, and structural support at no additional cost to the owner for the use of alternate manufacturer's system.
 2. Contractor shall submit all required revisions caused by the use alternate manufacturer's system for review per Division 01 Section: "Submittal Procedures".
- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: For power, signal, and control wiring.
 - a. Installing contractor shall provide coordinated AS-BUILT control wiring drawings.
 - b. Control wiring drawings shall detail VRF wiring, thermostat wiring, thermostat locations, and wiring to the BAS.
- F. Samples for Initial selection: For units with factory-applied color finishes.
- G. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.
- H. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- I. Manufacturer's Field Reports: Submit start-up report for each unit.
- J. Operation and Maintenance Data: For split-system air conditioning units to include in emergency, operation, and maintenance manuals.
- K. Warranty: Sample of special warranty.
- L. Submission of all submittals shall be made electronically via email with PDF attachments to bowman_submit@bowman.com

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 Section: "Contract Closeout Procedures": Closeout Procedures.
- B. Project Record Documents: Record actual locations of controls installed remotely from units.
- C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.6 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL – 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 produced in an ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- D. Any approved manufacturer shall be rated and certified in accordance with AHRI standard 1230 and meet minimum efficiencies as scheduled.
- E. The approved manufacturer shall have parts, equipment and materials stocked.
- F. The approved manufacturer shall have factory trained service technicians available.
- G. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2010 and installed to resist the wind pressures on the equipment and the supports.
- H. The condensing unit will be factory charged with R410A.
- I. Electrical components Devices and Accessories: listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- J. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, “Safety Standards for Refrigeration Systems”.
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1 Section 4 – “Outdoor Air Quality”, Section 5 – “Systems and Equipment”, Section 6 – “Procedures” and Section 7 – “Construction and Startup”.
- K. ASHRAE /IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- L. Sound Rating: Measure in accordance with ARI 270.
- M. Insulation and adhesives: Meet requirements of NFPA 90A.
- N. Perform Work in accordance with all applicable codes, standards, and local authorities having jurisdiction requirements.

1.7 COORDINATION

- A. Division 01 Section: “Project Management & Coordination”: Requirements for coordination.
- B. Coordinate installation of condensing units with existing site conditions and required traffic protection components.

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- C. Coordinate installation of air handling units with existing building structure, ceilings, and lights.

1.8 WARRANTY

- A. Division 01 Section: “Contract Closeout Procedures”: Product warranties and product bonds.
- B. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fall in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. For Compressor: Seven years from date of Substantial Completion.
 - b. For Parts: Two years from date of Substantial Completion.
 - c. For Labor: Two years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Division 01 Section: “Contract Closeout Procedures”: Spare parts and maintenance products.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set of each air-handling unit.
 - 2. Gaskets: Sets for each access door.
 - 3. Fan Belts: One sets for each air-handling unit fan.

1.10 PRE-INSTALLATION MEETINGS

- A. Division 01 Section: “Administrative Requirements”: Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 Section: “Product Requirements”: Product storage and handling requirements.
- B. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.
- C. Comply with manufacturer’s installation instruction for rigging, unloading and transporting units.
- D. Protect units from weather and construction traffic by storing in dry, roofed location.

1.12 INSTALLATION QUALIFICATIONS

- A. The system shall be installed by a factory trained contractor/dealer. The bidders shall be required to submit training certification proof with bid documents. The mechanical contractor's installation price shall be based on the systems installation requirements. The mechanical contractor bids with complete knowledge of the HVAC system requirements. Untrained contractors who wish to bid this project must contact the representative for the manufacturer shown on the drawings to arrange training prior to bid day.
- B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- C. Installer: Company specializing in performing Work of this section with minimum three years' experience.

1.13 MAINTENANCE MATERIALS

- A. Division 01 Section: "Contract Closeout Procedures": Requirements for maintenance materials.
 - 1. Furnish one set for each unit of fan belts and filters.

1.14 MAINTENANCE SERVICE

- A. Division 01 Section: "Contract Closeout Procedures": Maintenance service.
- B. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.
- C. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.15 OPERATING RANGE

- A. The operating range in cooling shall be -4°F DB ~ 122°F DB.
- B. The operating range in heating shall be 0°F DB ~ 77°F DB/-4°F WB- 60°F WB.

PART 2 - PRODUCTS

2.1 VARIABLE REFRIGERANT FLOW (VRF) HEAT PUMP SYSTEM

- A. Basis of design shall be Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s).

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- B. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi.
1. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.
 2. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
 3. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- C. Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and an integral DDC (Direct Digital Controls) system. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.
- D. HIGH EFFICIENCY (HEAT RECOVERY), AIR COOLED OUTDOOR UNITS
1. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
 2. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
 3. Outdoor unit shall have a sound rating no higher than 68 dB(A) individually or 70 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
 4. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
 5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.
 6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 7. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective

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- manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
8. The outdoor unit shall be capable of operating in heating mode down to -25F ambient temperatures or cooling mode down to 23F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
 9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.
 10. 10. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.
 11. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.
 12. In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.
 13. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
 14. VRF four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.
 15. Unit Cabinet:
 - a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
 - b. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.
 16. Fan:
 - a. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.
 - b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
 - c. All fans shall be provided with a raised guard to prevent contact with moving parts.
 17. Refrigerant and Refrigerant Piping:
 - a. R410A refrigerant shall be required for systems.

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- b. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
 - c. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
 - d. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
 - e. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.
18. Coil:
- a. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil
 - b. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.
 - c. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.
 - d. The coil shall be protected with an integral metal guard.
 - e. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
 - f. Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.
 - g. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.
19. Compressor:
- a. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.
 - b. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single

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- compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.
- c. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting “belly-band” type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.
 - d. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.
 - e. The compressor shall be equipped with an internal thermal overload.
 - f. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
 - g. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.
20. Controls:
- a. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.
 - b. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.
21. Electrical:
- a. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.
 - b. The outdoor unit shall be controlled by integral microprocessors.
 - c. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

E. BRANCH CIRCUIT (BC) CONTROLLERS AS REQUIRED FOR SIMULTANEOUS HEAT/COOL SYSTEMS

- 1. BC (Branch Circuit) Controllers (or comparable branch devices) shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.
- 2. BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.
- 3. BC Unit Cabinet:

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- a. The casing shall be fabricated of galvanized steel.
 - b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
 - c. The unit shall house two tube-in-tube heat exchangers.
 - d. Refrigerant Piping (specifications in addition to those for outdoor unit):
 - e. All refrigerant pipe connections shall be brazed.
 - f. Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.
4. Refrigerant valves:
- a. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
5. Future Use Branch:
- a. Each VRF system shall include at least one (1) unused branch or branch device for future use. Future-use branches or branch devices shall be fully installed & wired in central location with capped service shutoff valve & service port.
6. Condensate Management:
- a. BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.
7. Electrical:
- a. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
 - b. The BC Controller shall be controlled by integral microprocessors
 - c. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

F. 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 2X2 GRID INDOOR UNIT

1. The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. Unit Cabinet:
 - a. The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.

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- c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
- 3. Fan:
 - a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - c. The indoor fan shall be capable of three (3) speed settings, Low, Mid, and High.
 - d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 - e. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
 - f. Grille shall include an optional "3D i-see" sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39' detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.
- 4. Filter:
 - a. Return air shall be filtered by means of a long-life washable filter.
- 5. Coil:
 - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
 - b. The coils shall be pressure tested at the factory.
 - c. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
- 6. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 7. Controls:
 - a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
 - b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
 - c. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
 - d. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur, the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

G. CITY MULTI CONTROLS NETWORK

1. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.
 - a. The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
 - b. Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
 - c. System shall be capable of email generation for remote alarm annunciation.
2. Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.
3. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
4. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
5. Wiring type:
 - a. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
 - b. Network wiring shall be CAT-5 with RJ-45 connection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of units.
- B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- C. Examine walls, floors, and roofs for suitable conditions where condensing units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

- E. Verify concrete pad for condensing unit is ready for unit installation.

3.2 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- B. Install roof-mounting units on equipment supports specified in Division 07.
- C. Vibration Isolation: Mount condensing units on Vibration isolation devices. Installation requirements are specified in Division 23 Section: "Vibration and Seismic Controls for HVAC Piping and Equipment.
- D. Maintain manufacturer's recommended clearances for service and maintenance.
- E. Install floor mounted units on 4" high concrete housekeeping pads. Pad to be 6" wider than the unit on all sides. Refer to Division 23 Section: Cast-In-Place Concrete."
- F. Install flexible connections between unit and inlet and discharge ductwork. Install metal bands of connectors parallel with minimum 3 inch flex between ductwork and fan while running. Refer to Division 23 Section: "HVAC Air Distribution."
- G. Install components furnished loose for field mounting.
- H. Install connection to electrical power wiring in accordance with Division 26.
- I. Unless otherwise indicated install condensate piping with trap and route from drain pan to nearest floor drain Refer to Division 23 Section: "Pipes and Tubes for HVAC Piping and Equipment".
- J. Water-level monitoring devices: On down flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.
- K. Install Work in accordance with all applicable codes, standards, and local authorities having jurisdiction requirements.
- L. All wiring within the unit, where inside a control panel, shall be installed in UL approved conduit or raceway.
- M. Refrigerant circuit access ports located outdoors shall be fitted with locking-type-tamper-resistance caps.
- N. Install refrigerant piping from unit to condensing unit. Install refrigerant specialties specified in Division 23 Section: "Refrigerant Piping."
- O. Evacuate refrigerant piping and install initial charge of refrigerant.
- P. Install control wiring between air handling unit, condensing unit, and field installed accessories.

VARIABLE REFRIGERANT FLOW SPLIT SYSTEM AIR-CONDITIONERS

- Q. Install Work in accordance with all applicable codes, standards, and local authorities having jurisdiction.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to units to allow service and maintenance.
- C. Connect refrigerant piping to air-cooled units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 23 Section: "Refrigerant Piping".
- D. Ground equipment according to Division 26 Section: Grounding and Bonding for Electrical Systems".
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables".

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, change systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Verify proper airflow over coils.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- C. Remove and replace malfunctioning condensing units and retest as specified above.

3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Inspect for physical damage to unit casing.
 - 2. Verify that access doors move freely and are weather tight.
 - 3. Clean units and inspect for construction debris.
 - 4. Verify that all bolts and screws are tight.
 - 5. Adjust vibration isolation and flexible connections.

VARIABLE REFRIGERANT FLOW SPLIT SYSTEM AIR-CONDITIONERS

6. Verify that controls are connected and operational.
- B. Lubricate bearings on fans.
- C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- D. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.
- E. Measure and record airflow over coils.
- F. Verify proper operation of condenser capacity control device.
- G. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- H. After startup and performance test, lubricate bearings.

3.6 CLEANING

- A. Division 01 Section – "Contract Closeout Procedures": Requirements for cleaning.
- B. Vacuum clean coils and inside of unit cabinet.
- C. Install temporary filters during construction period. Replace with permanent filters at Substantial Completion.

3.7 DEMONSTRATION AND TRAINING

- A. Division 01 Section: "Contract Closeout Procedures": Requirements for demonstration and training.
- B. Demonstrate air handling unit operation and maintenance.
- C. Demonstrate starting, maintenance, and operation of condensing unit including low ambient temperature operation.
- D. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain systems.
 1. Train Owner's maintenance personnel on procedures and schedules for starting up and shutting down, trouble shooting, servicing and maintaining air handling units.
 2. Review data in maintenance manuals. Refer to Division 1 Section: "Contract Closeout Procedures".
 3. Schedule training with owner with at least seven (7) days advance notice.
- E. Furnish services of manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days' notice to Architect/Engineer of training date.

VARIABLE REFRIGERANT FLOW SPLIT SYSTEM AIR-CONDITIONERS

3.8 VARIABLE REFRIGERANT FLOW SYSTEM

A. General

1. The installation shall be in accordance with the manufacturer's Installation, Operating and Maintenance Instructions with regard to application, mechanical and electrical requirements. It shall be the responsibility of the contractor to carry out proper installation and guarantee operational status.
2. Refrigerant piping associated with equipment that must be relocated due to field conditions shall be resized and approved by the VRV system manufacturer.

3.9 MANUFACTURER'S FIELD SERVICES

- A. Division 01 Section: "Quality Requirements": Requirements for field services.
- B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.
- C. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.
- D. Furnish services of factory; trained representative for minimum of two days to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.10 PROTECTION OF FINISHED WORK

- A. Division 01 Section: "Contract Closeout Procedures" for requirements for protecting finished work.
- B. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this and other sections of Electrical and Special Construction Divisions.

1.2 SUMMARY

- A. This section includes qualification requirements of the installer and suppliers, submittal procedures, record keeping, required testing and general electrical procedures.
- B. Section Includes:
 - 1. Additional submittal requirements.
 - 2. Installer and product requirements.
 - 3. Identification of equipment.
 - 4. Firestopping for electrical installations.
 - 5. Supporting devices for electrical components.
 - 6. Concrete equipment pads.
 - 7. Fuses.
 - 8. Equipment connections.
 - 9. Cutting and patching for electrical construction.
 - 10. Touch up painting.
 - 11. Electrical demolition.
 - 12. Project conditions.
 - 13. Additional warranties.
 - 14. Utility coordination.
- C. Related Sections:
 - 1. Section "Vibration & Seismic Controls for Electrical Systems" for special project conditions, supporting products and requirements.
 - 2. Section "Low Voltage Electrical Distribution" for concrete pad requirements.
 - 3. Section "Low Voltage Transformers" for concrete pad requirements.
- D. Permits and Fees:
 - 1. Apply, pay for and secure all permits, required by the Authorities Having Jurisdiction prior to start of work, in accordance with contract General Conditions and Division 01.
 - 2. Deliver all certificates to the Owner prior to final acceptance of work.
- E. Conflicts:
 - 1. Where variances occur within drawings and/or specifications, procedures of the General Conditions shall be followed.
 - 2. In cases where clarification is not requested, provide the item or arrangement of

3. better quality, greater value, or higher cost in the Contract Price.
Bring to the Architect's attention, any field conflicts or existing conditions, which prevent the intended work as designed.

1.3 ACRONYMS

- A. The following acronyms are used throughout the Electrical Division specifications, defined as follows:

- | | | |
|-----|--------|--|
| 1. | AASHTO | American Association of State Highway and Transportation Officials |
| 2. | ADA | Amer. With Disabilities Act |
| 3. | ANSI | American National Standards Institute |
| 4. | ASME | American Society of Mechanical Engineers |
| 5. | ASTM | American Society for Testing and Materials |
| 6. | IBC | International Building Code |
| 7. | IEEE | Institute of Electrical and Electronics Engineers |
| 8. | ETL | Electrical Testing Laboratory |
| 9. | FM | Factory Mutual Research Corporation |
| 10. | NEC | National Electrical Code |
| 11. | NECA | National Electrical Contractors Association |
| 12. | NEMA | National Equipment Manufacturers Association |
| 13. | NESC | National Electrical Safety Code |
| 14. | NETA | National Electrical Testing Association |
| 15. | NFPA | National Fire Protection Association |
| 16. | NLPI | Lightning Protection Institute |
| 17. | UL | Underwriter's Laboratories |

1.4 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term product includes the terms material, equipment, system, and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 3. Comparable Product: Product that is to be demonstrated and approved through the submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes proposed by Contractor in products, materials, equipment, and methods of construction required by the Contract Documents.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is the only named manufacturer or is the "first" named manufacturer, or is accompanied by the words "basis of design," including make or model number or other designation, to

establish the significant qualities related to type, function, dimensions, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner
- E. Extended Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.5 SUBMITTALS

- A. General: Submit each item in this Section according to the conditions of the contract and Division 01 Specification Sections.
- B. Comply with Division 01 Section "Submittal Procedures".
- C. General:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Installation and Coordination Drawings
 - 4. Record Documents
 - 5. Operation and Maintenance Manuals
 - 6. Construction Phasing and Outage Schedule
 - 7. Emergency power and temporary power plans for existing building.
- D. Submittal Deviations from Contract Documents:
 - 1. Submittals shall explicitly identify any deviations from the drawings, specifications or design intent, including, but not limited to:
 - a. Different products used.
 - b. Products used in different locations from where shown or specified.
 - c. Changes to intended application, location, etc.
 - d. Changes to capacity, rating or size.
 - e. Differences in physical sizes, dimensions and/or weights which will create installation, clearance or access problems or Code violations.
 - 2. Contractor shall clearly and specifically identify each such deviation, substitution or change to the contract documents to Architect's attention via note, clarification, etc. It is NOT considered to be explicitly identified simply by showing a device on the plans or including a product page in the submittal.
- E. Basis-of-Design Comparable Products Submission:
 - 1. Contract Drawings are based on only the named "Basis of Design" products.
 - 2. Engineer has not verified that any Comparable Products by manufacturers other than the "Basis of Design" equipment will properly fit, perform or meet the design intent and contract documents.
 - 3. Contractor must verify sizes, ratings, dimensions, clearance requirements, weight, etc. of any/all manufacturers. Contractor is responsible for the fitment of their proposed equipment, and resulting impacts to other construction or disciplines, Code compliance, etc.
 - 4. Document each Submittal, Comparable Product or Substitution request with

supporting data substantiating compliance of proposed product with Basis-of-Design product.

- F. Product Substitutions: Comply with all requirements of Division 01.
- G. Comparable Products Submission:
 - 1. Document each request for a proposed comparable product with supporting data substantiating compliance of proposed product with Basis-of-Design product.
- H. Coordination of Submittals: Coordinate Electrical and Special Construction Division submittals with those of all other Divisions. Also, review submittals of all other disciplines' submittals specifically for proper coordination of electrical circuits, including locations, ratings and types of required connections. Coordinate all electrical provisions and rough-ins with all other project disciplines.
- I. Electrical Division additional submittal requirements: On projects where Div 01 does not specify otherwise, and where Owner does not have a defined submittal procedure, provide submittals, as follows. Where Div 1 specs are applicable, also provide the following.
 - 1. Clearly identify all submittals, as follows:
 - a. Number each submittal starting with the specification section associated with the product(s). Each successive product from same spec section shall utilize a sequential suffix (i.e. -01, -02).
 - b. Following each number, include specific English name of each product. (i.e. Spec Section # - Panelboards).
 - c. Do not combine product data from different spec sections into a single submittal package as this may prevent approval of one product due to resubmission requirement of another.
 - d. Provide catalog spec and/or data sheets to completely describe proposed equipment. A product model number alone, with no supporting description or data will not be approved.
 - e. Where numerous models or product numbers appear, clearly indicate the exact type, model number, size, options, and special features of the proposed item.
 - f. Factory order forms showing only required capacities, are not acceptable.
 - g. Identify all options furnished to meet specifications.
 - h. The Architect shall not select or mark equipment ratings and/or options. Submittals not properly and specifically marked shall be returned without review.
 - 2. Identify any discrepancies in the contract documents affecting submittals and seek clarification.
 - 3. Product data PDF's shall contain only product cut sheets, data sheets or catalog pages as pertain the proposed products. Use of manufacturer's PDF catalog pages shall be limited to only those pages relevant to the proposed products. Submittals consisting of entire catalogs of other products, irrelevant data, etc. shall be returned without review.
 - 4. Submit all related product drawings, data sheets, layout drawings, etc. for each system or product in a single submittal. Do NOT submit product data, wiring diagrams and calculations for one product submittal as multiple separate submittals or PDF's.

J. Product Data:

1. Manufacturer's specifications, data sheets.
2. Catalog cuts.
3. Dimensional drawings.
4. Installation Instructions.
5. Wiring & connection diagrams.
6. Capacity ratings, performance curves.
7. Information required indicating contract compliance.
8. Clearly indicate the exact size or rating proposed.

K. Shop Drawings:

1. All specially fabricated items.
2. Modifications to standard items.
3. Specially designed systems or products.

L. Closeout Submittals: Submit in accordance with the General Conditions and Division 1 requirements.

1. Electrical Division Operation and Maintenance Manuals:
 - a. Arrange material in sections according to Electrical Division spec sections.
 - b. Include a cover sheet, which contains the name and phone number of the Installer, Distributor, Supplier, Local Service Company, etc. for each system or product group.
 - c. O & M Manuals shall also include the following:
 - d. Material and Equipment List.
 - e. Copies of all approved submittals.
 - f. Acceptance Test Reports (ground resistance, etc.)
 - g. Manufacturer's Product Warranties.
 - h. Factory data sheets, wiring diagrams, etc.
 - i. Spare parts lists.
 - j. All operation and instruction papers.
 - k. Maintenance schedules.
2. Record Drawings:
 - a. During construction, maintain drawings on blue or black line white prints.
 - b. Record all changes and alterations in red ink.
 - c. Record the installed electric feeders, equipment, etc.
 - d. Actual installed locations of panels, switchboards, transformers, etc.
 - e. All feeders overhead, underslab or in chases.
 - f. Pullboxes, handholes and splice box locations.
 - g. All underground feeders, conduit, ducts, cables, handholes, manholes, etc. with installed dimensions from permanent construction elements.
 - h. All modifications, changes, deletions or additions made during construction.
 - i. Submit one (1) complete set of contract drawing prints with "as-built" information neatly recorded in RED at project completion. Submit files in PDF format.

M. Required Submittals: Submit the following items, as a minimum requirement for this project:

1. Section "Common Work Results for Electrical":
 - a. Material and Equipment List
 - b. Coordination Drawings for Electrical, Mechanical, IT Rooms, etc.
 - c. Electrical Installer Qualifications
 - d. Fire Stop materials
 - e. Access Panels
 - f. Copies of Electrical Inspection Reports
 - g. Equipment Acceptance Test Reports
 - h. Completed Punchlist with contractors' initials/dates
 - i. Record drawings
 - j. O&M Manuals
2. Section "Low Voltage Electrical Power Conductors and Cables":
 - a. Building wires and conductors.
 - b. Cables and cable assemblies.
 - c. Splices and connectors.
 - d. Acceptance testing of conductors, feeders, etc.
3. Section "Grounding and Bonding for Electrical Systems":
 - a. Ground rods
 - b. Ground buses
 - c. Exothermic Welds
 - d. Ground Resistance testing
4. Section "Raceways and Boxes for Electrical Systems":
 - a. Conduits.
 - b. Surface raceways.
 - c. Floor mounted devices.
5. Section "Vibration and Seismic Controls for Electrical Systems":
 - a. Engineering calculations/design for supports/bracing
 - b. Product data
6. Section "Low Voltage Electrical Distribution":
 - a. Enclosed and automatic circuit breakers.
 - b. Safety Disconnect Switches.
 - c. Panelboards.
 - d. Post Installation acceptance testing reports.
7. Section "Wiring Devices":
 - a. A/C switches.
 - b. Receptacles.
 - c. Connectors.
 - d. Device plates and covers.
8. Section "Low Voltage Controllers":
 - a. Thermal manual motor starter switches.
 - b. Motor starters.

1.6 ELECTRONIC AUTOCADD DOCUMENTS

- A. Requests for electronic Autocadd documents will be accommodated to the contractors and installers upon receipt of Bowman's Electronic Document Release Form. Only floor plans and part plan drawings shall be provided.

1.7 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 1. The Terms "Listed and Labeled": As defined in the National Electrical Code,

- Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.
- B. Underwriter’s Laboratory (UL) Requirements: All equipment containing electrical components and provided under electrical, mechanical, or other Divisions shall bear the Underwriter’s Laboratory (UL) label, as a complete packaged system.
- C. Field Certifications and Labeling:
1. Equipment not provided with a UL label shall be tested in the field certified and provided with a listed label at the installer’s expense.
 - a. Field testing shall be performed by a testing agency approved by the authority having jurisdiction.
 - b. Provide services of a UL recognized, independent Electrical Testing Laboratory (ETL) to provide field inspection and testing. Provide an ETL Label on all such equipment as proof of satisfactory inspection.
- D. Fire Safe Materials: Unless otherwise indicated, materials shall conform to UL, National Fire Protection Agency (NFPA) or American Society for Testing and Materials (ASTM) standards for fire safety with smoke and fire hazard rating not exceeding flame spread of 25 and smoke developed of 50.
- E. Install all components and equipment per manufacturer’s written instructions.
- F. Installer Qualifications:
1. Provide proof of qualification. Submit the following, when requested:
 - a. Five (5) comparable completed projects.
 - b. Reference letters from minimum of three (3) registered professional engineers, general contractors, or building owners, explaining proficiency, quality of work, or other attribute on projects of similar size or substance.
 - c. Copy of Master Electrician's License.
 - d. Local or State license.
 2. Electrical installer shall utilize a fulltime project foreman in charge of all electrical work.
 - a. Fully qualified and experienced in such work.
 - b. Available on site at all times during construction.
 - c. All communication shall be through this person.
- G. Installation Quality: In accordance with listed Codes, recognized trade organizations and standards.
1. ADA Americans with Disabilities Act Accessibility Guidelines
 2. ANSI/EIA/TIA American National Standards Institute
 3. ASME American Society of Mechanical Engineers
 4. IEEE C2 National Electrical Safety Code
 5. NEMA National Equipment Manufacturers Association
 6. NECA National Electrical Contractors Assn Standards of Installation
 7. NEMA National Electrical Manufacturer’s Association
 8. NETA National Electrical Testing Association
 9. UL Underwriter’s Laboratories

- H. Comply with the latest version of following Codes, Standards and regulations as adopted by the Authority Having Jurisdiction, unless otherwise specified.

1. NFPA
2. NFPA 70 "National Electrical Code".
3. IBC
4. IECC
5. COMAR (Code of Maryland Regulations).
6. State of Maryland Fire Prevention Code
7. Baltimore County Electrical Code
8. Local Amendments to the above Codes

1.8 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:

1. Arrange for proper shipping methods for all materials.
2. Provide for handling and unloading of all materials at site or at offsite storage facility.
3. Provide for proper transportation between offsite storage and project site.
4. Provide rigging and other handling services, when necessary.

- B. Storage and Protection:

1. Store all materials in dry, heated areas, unless manufacturers permit other storage environments.
2. Store equipment according to manufacturers' written instructions.
3. Protect materials subject to damage or corrosion from excessive moisture.
4. Protect equipment subject to damage from excessive heat or sunlight in ventilated environments.
5. Protect equipment from dripping, splashing or sprayed materials.

- C. Repair and Replacement of Damaged Equipment: Repair equipment damaged as a result of improper storage or handling at no expense to Owner. If, in the opinion of the Architect, equipment cannot operate properly after repairs are made, replace at no cost to Owner.

1.9 PROJECT CONDITIONS

- A. Occupied Building: Allowances shall be considered and included in bids for performing work within existing, occupied buildings. Certain functions, i.e. core drilling, may be limited in their allowed times, due to disturbance of other occupants. Work occurring within occupied areas may require scheduling of work during unoccupied periods.

1.10 SEQUENCING

- A. General Sequencing:

1. Coordinate electrical work with other trades based on phasing and sequence of construction, as identified elsewhere in the contract documents.
2. Provide all scheduling, phased installation, etc. to coordinate with overall phasing plans.

- B. Electrical Division Sequencing, Coordination, and Integration:

1. Coordinate systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
4. Coordinate the installation of required supporting devices, sleeves and conduit to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Make provisions for large equipment requiring positioning prior to closing in the building.
6. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
7. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
8. Coordinate requirements for access panels and doors where electrical items requiring access are concealed behind finished surfaces.

1.11 WARRANTY

- A. Provide warranty in accordance with the General Conditions and Division 01 requirements, and as stated herein.
- B. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- C. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include project-specific information and properly executed.
 2. Refer to other specification Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Special Warranties: Provide additional product and/or installation warranties for particular products, as specified within individual specification sections.
- E. Obtain all warranty papers and records from the Original Equipment Manufacturer (OEM) according to their warranty policy and deliver the same to the Owner. Fulfill all the OEM's requirements to validate the warranty at conclusion of project. Include copies of warranty papers with Closeout Submittals.

1.12 MAINTENANCE

- A. Extra Materials: Provide extra, loose and/or spare materials, as required by individual specification sections.
- B. Maintenance Service: Provide preventative maintenance services or maintenance services as required by individual specification sections.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with Contract Documents, which are undamaged and new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.
 - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Where products are accompanied by the term as selected, Architect will make selection.
 - 4. Where products are accompanied by the term match sample, sample to be matched is Architect's.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. General Compliance Requirements: Compliance requirements for individual products, as indicated in Contract Documents, are multiple in nature and may include generic descriptions, performance requirements, compliance with reference standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.
- C. Procedures for Selecting Products: Contractor's options for selecting products are limited by Contract Document requirements and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.
- D. Products specified by Reference Standards, Codes and Regulations: Select from among products, which can be shown to comply to, referenced documents.
- E. Products specified by Naming Products and Manufacturers: Select from among products listed.
- F. Products specified by Naming One Manufacturer's Product as the Basis-of-Design with Reference to Other Manufacturers: Select either the specified Basis-of-Design product or an approved comparable product by one of the other named manufacturers.
 - 1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named manufacturers.
- G. Products specified by Naming One Manufacturer's Product and Indicating Option of Selecting Comparable Products by stating or Approved Equivalent or similar language: Select either the specified product or an approved comparable product.
 - 1. Comply with provisions in Comparable Products Article to obtain approval for use of an unnamed comparable product by another manufacturer.
- H. Visual/Aesthetic Match Requirements: Certain products may have been specified or scheduled to achieve a particular appearance, shape, color, etc. This may apply to light fixtures and other products. Where specs or schedules indicate "Color by Architect", a final color selection shall be made from the product manufacturer's product line that includes both standard and premium colors.

2.2 COMPARABLE PRODUCTS

- A. Where Basis-of-Design products are specified by name, submit the following, in addition to other required submittals, to obtain approval of a comparable product by one of the named manufacturers:
1. Evidence that the proposed comparable product does not require revisions to the Contract Documents and is consistent with the Contract Documents.
 2. Documentation that the proposed comparable product will produce the indicated results and is compatible with other portions of the Work.
 3. Detailed comparison of significant qualities of proposed product with the Basis-of-Design product in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, serviceability, visual effect, and specific features and requirements indicated.
 4. Evidence that proposed product provides specified warranty.
 5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 6. Samples, if requested.

2.3 IDENTIFICATION PLATES

- A. General:
1. Dimensions: Minimum of 1" H x 2 1/2" W.
 2. Lettering: All capitals, 1/4"H x 1/16" stroke. Indicate circuit number, device (EXHAUST FAN 1, PUMP No. 2, etc.).
 3. Indoor Tags:
 - a. Laminated phenolic plastic.
 - b. White with black engraved letters.
 - c. Stainless steel attaching screws.
 4. Outdoor Tags:
 - a. Stainless steel tag.
 - b. Stainless steel attaching screws.
 5. Handhole Cable Tags:
 - a. Stainless steel tag.
 - b. Nylon cable ties.

2.4 LOW VOLTAGE TERMINAL IDENTIFICATION

- A. Permanent identification in accordance with the manufacturer's shop drawings or product data.
- B. Identify all control cables and wires:
1. All indoor locations:
 - a. Nylon, self-adhesive.
 - b. Factory printed with permanent numerals/letters on white background.
 2. LEM Wire Markers, or comparable product by 3M or Panduit.

2.5 FIRE STOPPING MATERIALS

- A. General:

1. UL 1479 Listed, Fire Tests For Through-Penetration
- B. For large openings:
1. 2-part, RTV silicone elastomer expanding foam.
 2. 3-4X expansion.
 3. STI Pensil Series PEN Foam, Dow Corning Fire Stop Foam, or comparable product by 3M.
- C. For small openings and voids (less than 1"):
1. 1-part, Intumescent sealant.
 2. Permanent, flexible and resilient.
 3. 5X free expansion.
 4. Red color for instant identification as fire barrier.
 5. 4-hour fire rating.
 6. STI Spec Seal Intumescent Sealant, 3M Fire Barrier Sealant, or comparable product by Dow.

2.6 TAMPER PROOF HARDWARE

- A. Provide tamper proof hardware for all panels, devices, pull boxes, junction boxes, cover plates, light fixtures and any other equipment or items accessible to prisoners, as indicated on the drawings. Equipment requiring tamperproof hardware, includes but is not limited to:
1. Junction/pull boxes
 2. Receptacles, switch, or outlet coverplates
 3. Light fixtures
- B. Hardware shall use standard manufactured design, using center-pin torx screws.
- C. Provide Owner with two (2) sets of each size of hardware wrenches, drivers, etc. needed for all hardware sizes installed on this project.

2.7 SPECIAL TOOLS & OPERATING ACCESSORIES

- A. Wherever any products provided under this Division have tamperproof, special or restrictive hardware, as specified or where provided from the manufacturer as standard or optional construction, provide a minimum of two (2) matching tools, bits, sockets, etc. needed for operation and/or access to such items. This shall include, but is not limited to:
1. Tamperproof screws, bolts, etc. on devices, enclosures, covers, etc.
 2. Any other special tools which are unique to that product.

2.8 POWER DISTRIBUTION BLOCKS

- A. For connections and/or taps made within auxiliary wiring troughs, junction boxes, etc. Install within wiring troughs, with all necessary clearances around blocks, with required wire bending radii.
1. Plated aluminum terminal blocks.
 2. Lexan, fiberglass, or other insulating material molded around to insulate block from mounting surface and provide side protection from adjacent wiring and

- surfaces.
- 3. UL Listed for 600 volts.
- 4. 1, 2, 3 or 4 terminal blocks on a common insulated mounting, as required.
- 5. Uninsulated terminal block for ground conductors to ground mounting surface, trough, etc.
- 6. Hex drive set screws for conductor connections.
- 7. Suitable for copper conductors.
- 8. IlSCO type PDB, or comparable product by Littelfuse or Marathon.

2.9 LOW VOLTAGE FUSES (0 - 600 VOLTS)

- A. UL 248, "Low Voltage Fuses" Listed, 250 or 600 volt, ratings per drawings or protected equipment manufacturer's nameplate.
- B. Class RK-1:
 - 1. Current limiting, dual element, time delay.
 - 2. Interrupting rating of 200,000 amps rms symmetrical.
 - 3. Class R rejection clips.
 - 4. Buss Low Peak LPS-RK (600 V) or LPN-RK (250 V), Littelfuse LLSRK (600 V) LLNRK (250 V).
- C. Blown Fuse Indication:
 - 1. For all fuses 100A and larger.
 - 2. Automatic indication of blown (open) fuse.
 - 3. Viewing window or indicating light.
 - 4. Buss SAMI fuse covers or Littelfuse Indicator.
- D. Spare Fuses:
 - 1. Provide spares for each installed type and rating.
 - 2. Minimum of (3) for 1-9 installed, (6) for 10-18 and (10) spares where more than 18 are installed.
 - 3. Deliver to OWNER at completion of contract.

2.10 SUPPORTING DEVICES

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8" on center, in at least one surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.

- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"- type hangers.
- D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.

2.11 CONCRETE EQUIPMENT PADS

- A. Materials:
 - 1. Interior Pads: 3000 PSI concrete at 28 days.
 - 2. Exterior Pads: 3500 PSI concrete at 28 days; air entrained mix.
 - 3. Steel mesh or rebar reinforcing, where required.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Examine site and existing conditions prior to submitting bids.
 - 2. Carefully examine proposed locations where work will occur in existing buildings and excavation near existing piping, conduit, cable, structures, etc.
 - 3. Make required allowances for the conditions.
 - 4. Request clarifications and or directions in writing, if required.
 - 5. No allowance will be made for any errors, oversights or other negligence on the part of the Installer.

3.2 PREPARATION

- A. Protection:
 - 1. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 - 2. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- B. Construction Power:
 - 1. Obtain and pay for temporary electrical service for construction power, trailers, etc.
 - 2. Provide all underground and/or overhead equipment, transformers, overcurrent devices, wires, connections, etc. for obtaining power from utility company or Owner's electrical lines.
 - 3. Pay all charges for connections, accounts, metering and consumption charges

for construction power.

C. Temporary Power:

1. Provide temporary power connections, transformers or generators for existing buildings during all outages.
2. Provide full power availability at all times unless directed otherwise by Owner.
3. Installer shall determine temporary power requirements of buildings in order to size temporary transformer or generator.
4. Remove all temporary power installations and connections after permanent power is established and/or prior to completion of project.

D. Interface With Site Utility Companies:

1. Contact MISS UTILITY prior to any excavation or underground work.
2. Contact serving utility companies immediately upon award of contract. Do not install related equipment until fully coordinated with appropriate utilities.
3. Provide all construction schedules, dates of requested services, outage windows, equipment locations, etc. necessary for utility work.
4. Contractor shall contact each serving utility company to schedule the performance of work by utility company(ies) when site conditions are ready (including raceways, handholes/manholes, backboards, etc. installed by contractors).
5. Electric Utility:
 - a. Coordinate service entrance equipment and layout with power company prior to ordering or installing any service entrance equipment.
 - b. Furnish and install all incoming raceway, metering cabinets and meter sockets.
 - c. Coordinate cable, conduit, lug and C/T cabinet sizes for proper interface between utility owned/installed equipment and contractor-installed equipment.
 - d. Provide concrete pad for utility company's transformer as required by Utility.

E. Utility Outages:

1. Schedule, stage, and perform all work such that interruptions to existing utilities and services are kept to a minimum.
2. No outages shall occur without prior written notification of Owner and/or User.
3. All required outages should be approved by the owner for optimum time scheduling.
4. Written notice of not less than 15 calendar days shall precede all power outages.

3.3 INSTALLATION

A. General Requirements:

1. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings.
2. Install work, generally as shown. Carefully examine all contract drawings and fit the work in each location without substantial alteration. Where departures are proposed or required, submit detailed drawings for acceptance.
3. Installation shall provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

4. Install all items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
 5. Install equipment with proper service and access clearances as required by NEC and manufacturers' requirements.
 6. Install such that future service or replacement shall not require interference with or removal of other installations.
 7. Provide access to all equipment, splice boxes, switches, controls and other devices, without use of poles, ladders, scaffolding, etc.
 8. Where equipment requiring access or service is concealed behind finished surfaces, provide access panel(s) or door(s).
- B. Penetration of Fire Rated Construction:
1. Seal all in and around conduits and other electrical materials penetrating or creating openings in fire-rated, fire resistant or fire-stopped walls, ceilings, partitions and floors.
 2. Contractor is responsible for the coordination, means & methods, and costs for all penetrations required for the installation of the work.
- C. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- D. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- E. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow concrete masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
 3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
 4. In partitions of light steel construction use sheet-metal screws.
 5. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.
 6. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
 7. Fill and seal holes drilled in concrete and not used.
 8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.
- F. Rough-in:
1. Contract drawings are generally diagrammatic.
 2. Provide all offsets, bends, fittings and accessories, required to fit the work to the

- conditions, even though not specifically shown.
 - 3. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
 - 4. Refer to equipment specifications in all other Divisions for rough-in requirements.
 - 5. The Owner, and/or his/her representative, reserves the right to make reasonable changes in location of equipment, conduit and wiring up to the time of rough-in or fabrication.
- G. Cutting and Patching: Provide all cutting and patching in accordance with Division 1 and per the following requirements.
- 1. Perform all required cutting, fitting, and patching necessary for installation of Electrical Division work.
 - 2. Cut, remove and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical systems and equipment as indicated on the drawings and specifications and other electrical items made obsolete by the new Work.
- H. Tamper Proof Hardware:
- 1. Provide tamper proof hardware for all equipment, devices, cover plates, outlets, and all other equipment provided under Electrical and Special Construction Divisions, where such equipment is accessible to prisoners at any time. Prisoner locations are indicated on the contract drawings.

3.4 CONCRETE EQUIPMENT PAD INSTALLATION

- A. Interior Equipment Pads: Install concrete equipment (housekeeping) pads and bases for all transformers, switchgear, motor control centers, or other free-standing equipment.
- B. Exterior Equipment Pads: Install concrete pads with foundations for all on-grade transformers, docking station, generators, control cabinets and other equipment.
- C. Interior Pad Installation:
- 1. Steel dowel rods and bonding agent for anchoring to existing slabs.
 - 2. 2" wider than equipment in all directions.
 - 3. 1" x 45° chamfer on all sides.
- D. Exterior Pad Installation:
- 1. 4" wider than equipment in all directions.
 - 2. 1" x 45° chamfer on all sides.
 - 3. Reinforce with steel mesh or rebar.
 - 4. Provide minimum 30" deep (below grade) foundation on all sides.
 - 5. Pour footings against undisturbed or compacted earth. Extend footings below the frost line for the location where installed.
 - 6. Turn down rebar or mesh into all foundation walls.
 - 7. Lowest side minimum of 6" above final grade.
 - 8. Install vapor barrier between earth and concrete.
 - 9. Provide PVC sleeves for all cables, conductors, grounding, etc. to penetrate pad.

3.5 CONSTRUCTION

A. Connections to Existing Work:

1. Keep all existing systems in operation during the progress of the work.
2. Provide temporary connections, where necessary to maintain continuous operation until the new systems and equipment are ready for operation.
3. Provide all necessary alterations, cuttings, fitting, etc. of existing work to make satisfactory connections between the new and existing work.
4. Leave the complete work in a finished and workmanlike condition.
5. Relocate existing equipment, conduits, wiring, etc. required. Make changes to existing work as may be required.

B. Interface with Other Work:

1. Mechanical and Plumbing Division Equipment and Systems:
 - a. Provide the following for equipment furnished and/or installed under mechanical/plumbing Divisions, unless specifically noted otherwise:
 - b. Line voltage power wiring connections to equipment such as motors, AHU's, heaters, etc.
 - c. Disconnect means per NEC.
 - d. Manual or automatic starting contactors, starters, switches, etc.
 - e. Provide power to all motor operated smoke dampers furnished and installed under other Divisions. Coordinate control operation through fire alarm duct detectors, per Section "Fire Detection and Alarm".
 - f. Mounting and connection of starters, speed controls, variable frequency drives and other such equipment furnished by mechanical Division.
 - g. Low voltage wiring between transformers and plumbing fixtures (faucets, toilets, urinals, etc.) for automatic controls, or line voltage wiring to fixtures, as required by equipment furnished under mechanical Divisions.
2. All electrical work performed under mechanical and/or plumbing Divisions shall be provided in accordance with electrical specification Divisions.
 - a. Work performed/provided by mechanical Division shall include the following, unless specifically noted otherwise:
 - b. All low voltage and line voltage control wiring including conduits, wiring, branch circuit breakers, etc.
 - c. BMS or ATC system wiring and connections.
 - d. Line voltage connections to all motor operated dampers, automatic valves, etc.
 - e. Line voltage thermostats and associated wiring.
 - f. All relays, contacts and other control equipment required for operation of mechanical Division equipment.
 - g. Fuses within equipment, switches, control panels, etc. furnished from the factory with the equipment.
3. It is the intent to provide a complete and operational system. The work between mechanical and electrical Divisions is complementary and is meant to produce a single and operating system. Contractor shall make its own determination as to the distribution of responsibility among the various trades.
4. Equipment specified in other Divisions: Provide the following for equipment furnished and/or installed under Divisions, unless specifically noted otherwise:
 - a. Kitchen, kitchenette, coffee or break room equipment and appliances: Provide all rough-ins, outlets, and/or hardwired connections.
 - b. Elevators: Provide all power and low voltage rough-ins and connections to elevators and associated equipment, including:
 - 1) Elevator controller(s)
 - 2) Cab lights

- 3) Fire alarm connections for shunt trip operations.
 - c. Televisions and flat screen monitors: Provide power outlets and low voltage wiring backbox/conduit to all wall or ceiling mounted devices.
- C. Routing of Electrical Feeds to Roof Mounted Equipment:
 - 1. Conduit routing to roof mounted equipment shall be made to minimize the amount of conduit exposed above the roof.
 - 2. Route conduit from building interior within roof curbs, where possible.
 - 3. For condensing units and similar equipment, route conduit with refrigerant lines, using common penetrations through roof, coordinated with piping.
 - 4. Where conduit must be run horizontally on roof surface, follow other piping, refrigerant lines, etc. Provide blocking, etc. to support conduit at regular intervals, per NEC. Secure conduit to blocks, supports, etc. to prevent movement.
- D. Penetration of Waterproof Construction:
 - 1. Minimize penetration of roofs, exterior walls and interior waterproof construction.
 - 2. Provide necessary curbs, sleeves, shields, flashing, fittings and caulking to make the penetrations watertight.
 - 3. All penetrations shall comply with roof manufacturer's recommended materials and methods.
- E. Penetration of Fire Rated Construction:
 - 1. Seal all in and around conduits and other electrical materials penetrating or creating openings in fire-rated, fire resistant or fire-stopped walls, ceilings, partitions and floors.

3.6 DEMOLITION

- A. Remove and dispose of all existing materials not required for re-use or re-installation.
- B. Deliver on the premises, where directed, existing material and equipment which is to be salvaged and remain property of Owner.
- C. All other materials removed shall become the property of the Contractor and shall be removed from the premises.
- D. Remove conduit, hangers, supports, etc. to a point below the finished floors or behind finished walls and cap. Cut such items flush with masonry surfaces.
- E. Outdoor/Exterior Demolition Work:
 - 1. If cable cannot be removed due to collapsed duct, etc., cut cable at conduit entrance at each end and tag cable ends as "Abandoned Cable, Collapsed Duct" or similar reason.
 - 2. Remove outdoor pad-mounted gear, including concrete pads, ducts, etc. down to 48" below final grade.
 - 3. Remove overhead lines, poles, lights, etc. including service drops or laterals, conduit stubups, cable, pole base foundations and hardware.
 - 4. Remove and/or relocate all lighting, poles, wires, conduits, base foundations, etc. associated with roads and fences being demolished or affected by such work.

3.7 RE-INSTALLATION

- A. Where equipment is to be removed, and relocated or re-installed, provide careful removal of all items.
- B. Temporarily store all materials and equipment, which are to be re-installed. Protect from damage. Replace any items damaged during removal, storage or re-installation.
- C. Notify Owner immediately of any damaged or non-functioning equipment prior to removal or disconnecting. Document in writing or with photographs. Replace any damaged items for which Owner was not notified, at no cost to Owner.

3.8 REPAIR/RESTORATION

- A. Restore all finishes, equipment and surfaces to original condition, where affected by the work. Provide the following, as applicable:
 - 1. Replace damaged ceiling tiles.
 - 2. Replace ceiling tiles where removal has left holes or cuts in original tiles.
 - 3. Patch, repair and repaint all walls and surfaces cut, penetrated or otherwise disturbed by the work.
 - 4. Patch holes and penetrations in masonry and plaster.
 - 5. Provide suitable coverplates for all recessed backboxes of equipment removed and not covered by new devices.
 - 6. Provide larger trim or cover plates for new devices, where old backboxes, holes, etc. are not concealed by new work.
 - 7. Patch finished surfaces and building components using new materials matching existing materials and experienced Installers qualified with the materials and methods required for the surface and building components being patched.

3.9 FIELD QUALITY CONTROL

- A. General:
 - 1. Provide all circuits free from ground faults, short circuits and open circuits
 - 2. Perform tests specified or required to demonstrate that the work is installed and operating properly.
 - 3. Where specific tests are required, give proper notice and perform all necessary preliminary tests to assure that the work is complete and ready for final test.
 - 4. Other tests of a specific nature for special equipment shall be as specified under the respective equipment.
- B. Inspections:
 - 1. Schedule, pay for (as applicable) and attend all inspections required by the Authorities Having Jurisdiction.
 - 2. Deliver all certificates to the Owner prior to final acceptance of work.
 - 3. Notify Architect in advance of scheduled inspections.
 - 4. An electrical foreman, superintendent or other supervisor shall be in attendance for all scheduled electrical inspections.
 - 5. Schedule preliminary and rough-in inspections in a timely manner. Any work covered prior to any inspection in a manner which, in the inspector's opinion, precludes a complete inspection, shall be uncovered at the installer's cost.

6. Uncover Work to provide for installation of ill-timed Work.
 7. Disconnect installed work as specified for testing.
- C. Acceptance Testing: Provide for acceptance testing of electrical equipment, as follows, and as required in other electrical Division specification sections.
1. Pay for and schedule all required acceptance testing.
 2. Testing shall be by independent electrical testing contractor, licensed and certified by NETA.
 3. Testing company shall be independent of installing company (i.e. no subsidiaries).
 4. All tests shall be performed in accordance with the National Electrical Testing Association (NETA).
 5. Notify Architect and Owner in advance of all testing.
 6. Deliver all reports to Architect for approval.
 7. Retest all failed equipment after adjustment, repairs, etc.
 8. Provide all fuel, labor, etc. required for tests.
 9. All costs associated with preparations for actual testing shall be borne by the installer.
 10. Provide letter or statement on Testing Agency letterhead attesting to the satisfactory test results and suitability of the equipment to be energized and/or placed into service, as applicable. If testing reveals any problems or marginal results, the letter shall state these.
- D. Replacement of Faulty Work or Materials:
1. Replace any equipment, which fails NETA test results at the direction of the Owner. All replaced equipment shall be retested at no cost to Owner.
 2. Remove and replace all defective Work or materials.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Materials not installed per recognized standards, manufacturers' instructions, contract documents or design intent shall be removed and replaced when so directed by the Architect, at the Contractor's expense.
- E. Project Punchout Inspection: Architect/Engineer will perform punch out reviews and will provide the Contractor with a list of punch list items to be completed before contract close out. Each and every punch list item shall be initialed and dated by the Contractor when the work is complete. The Architect/ Engineer will not perform any punch list verification until all items have been completed, initialed, dated and the list returned to the Architect/Engineer. If any items have been initialed as being completed by the Contractor and the Architect/Engineer determines that the work is not complete, the Architect/Engineer shall be reimbursed by the Contractor at his regular hourly rate for any and all items requiring revisiting of the site by the Architect/Engineer. Reimbursement shall be made by deducting the Architect/Engineer's fee from the Contractor's final payment.

3.10 ADJUSTING

- A. General:
1. Lubricate, clean, adjust and test all equipment and systems in accordance with the manufacturer's instructions prior to initial operation.
 2. Do not operate equipment unless proper safety devices and controls are

- operational.
- 3. Provide all maintenance and service for equipment, which is operated during construction, and protect the equipment.

3.11 IDENTIFICATION

- A. Permanently identify all equipment in accordance with the project nomenclature.
 - 1. Starters, disconnects - identify fan, pump or load served and source circuit using contract nomenclature.
 - i.e. EXHAUST FAN NO. 1
Circuit RP1-1
 - 2. Miscellaneous controls, terminal boards, etc.
 - i.e. FIRE ALARM POWER SUPPLY
Circuit ELSR-3
- B. Identify all power conductors via colored insulation, or individual identification of phase wires with colored electrical tape at each junction box, panel or enclosure where conductors are visible. Color coding as listed below, on all building wiring and feeders:
 - 1. 208/120-V System: As follows:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - e. Ground: Green.
 - 2. 480/277-V System: As follows:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - d. Neutral: Gray.
 - e. Ground: Green.

3.12 EQUIPMENT MOUNTING

- A. Disconnects & Control Equipment:
 - 1. In sight of equipment served, with operating handle at 48-54" AFF.
 - 2. As close as practical to motor, etc.
 - 3. For large on-grade or roof mounted equipment, (i.e. DOAS, ACU's, etc.), mount to equipment housing or frames.
- B. Allow for proper clearance of electrical items and equipment served.

3.13 DEMONSTRATION

- A. Provide for equipment manufacturers' established representatives to demonstrate to Owner, the correct operation, safety, adjustments and maintenance of all electrical equipment and systems under this contract.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS & CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and conductors.
2. Cables and cable assemblies.
3. Splices and connectors.
4. Acceptance testing of conductors, feeders, etc.
5. Load balancing.

B. Related Sections:

1. Section "Common Work Results for Electrical."
2. Section "Grounding & Bonding for Electrical Systems" for coordination with grounding equipment and attachments.
3. Section "Raceways and Boxes for Electrical Systems."

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM B3 Soft or Annealed Copper Wire
2. ASTM B8 Concentric Lay Stranded Copper Conductors
3. ASTM B174 Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
4. ASTM B496 Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
5. ASTM B787 Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

B. Underwriters Laboratory (UL):

1. UL 4 Standard for Armored Cable
2. UL 44 Standard for Thermoset-Insulated Wires and Cables
3. UL 62 Standard for Flexible Cord and Cables
4. UL 83 Thermoplastic-Insulated Wires and Cables
5. UL 486A Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors.
6. UL 854 Service-Entrance Cables
7. UL 910 Standard for Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces

- | | | |
|-----|---------|---|
| | | Transporting Environmental Air |
| 8. | UL 1424 | Standard for Cables for Power-Limited Fire-Alarm Circuits |
| 9. | UL 1569 | Standard for Metal-Clad Cables |
| 10. | UL 1479 | Standard for Fire Tests of Through-Penetration Firestops |
| 11. | UL 1581 | Reference Standard for Electrical Wires, Cables, and Flexible Cords |

1.4 SUBMITTALS

- A. Submittal Requirements of this section:
1. Building wires and conductors.
 2. Cables and cable assemblies.
- B. Product data, including construction, materials, performance data, etc.
- C. Product Test Reports: Certified copies of manufacturer's design and routine factory tests required by the referenced standards.
- D. Provide submittal data for each cable or conductor type.
1. To verify specifications have been met/exceeded.
 2. Indicate UL listing for all products.

1.5 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT

- A. Packing, Shipping, Handling and Unloading:
1. Deliver wire and cable according to NEMA WC-26, "Binational Wire and Cable Packaging Standard."
- B. Storage and Protection:
1. Store wires and cables out of rain.
 2. Protect from physical damage.
 3. Guard against nicks and scratches.

PART 2 PRODUCTS

2.1 METAL CLAD CABLE (MC)

- A. Type MC metal clad cable for branch circuit applications.
1. Interlocking aluminum or galvanized steel armor.
 2. THHN/THWN-2 insulation, 90°C rated dry or wet.
 3. Solid Conductors through #10 AWG: Soft or annealed per ASTM B3.
 4. Stranded copper conductors for #8 AWG and larger, per ASTM B8 or B787
 5. Phase identified conductors.
 6. Insulated (green) equipment grounding conductor.
 7. Internal, overall, non-metallic tape shield around all conductors.
 8. UL 83, 1479, 1569, 1581 listed and tested per UL 2556. .
 9. NEC 230, 300, 320, 330, 518, 520, 530, 605 and 645 compliant.
 10. AFC MC, MC-Tuff, MC-Lite, or comparable product by Encore Wire, Southwire or

Service Wire.

2.2 600 VOLT BUILDING WIRE

A. Copper Building Wire:

1. UL 44, 83 and 854 Listed, 600 volt, 90°C:
2. All conductor sizes indicated are based on copper conductors.
3. Copper, stranded for #8 AWG, and larger.
 - a. Concentric per ASTM B3, B8, B787.
 - b. Compact round per ASTM B496.
4. #12 AWG minimum conductor size.
5. Thermoplastic Insulation:
 - a. Interior #8 and smaller: THWN-2 or THHN
 - b. Interior #6 and larger: THWN-2 or THW-2
 - c. All exterior wiring: THWN-2 or THW-2
6. Provide wires as manufactured by Pirelli or comparable product by Service Wire Corp, Okonite Company, Encore Wire, Southwire, Carol Cable, OmniCable, or Regency.

2.3 SPLICES & CONNECTORS

A. Splices & Connectors for copper conductors:

1. Dry locations:
 - a. #10 AWG and smaller: Insulated, solderless pressure type.
 - b. #8 AWG and larger: Hydraulic pressure indentation type, Burndy "Hy-dent", or comparable product by T&B.
2. In handholes, manholes and direct buried locations:
 - a. Silicone filled wire-nuts (King, or equal).
 - b. Compound filled splice or connectors.
 - c. Suitable for immersion in water.

2.4 LOW VOLTAGE CABLING

- A. Cables for low voltage systems shall be as specified in other sections. If not specified, cables shall be per system manufacturer's recommendations.
- B. All low voltage cabling installed on this project shall be UL Listed, plenum rated cable, unless installed in metal conduit.

PART 3 EXECUTION

3.1 APPLICATION

A. Branch Circuits:

1. Type THHN/THWN-2, copper conductor, in raceway.
2. Type MC cable, copper conductor, 90C insulation.

3.2 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and

the NECA "Standard of Installation."

- B. Remove existing wire from raceways before pulling in new wire and cable.
- C. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.
 - 1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
 - 2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
- E. Conductor Splices: Keep to minimum.
 - 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
 - 2. Use splice and tap connectors that are compatible with conductor material.
- F. Terminations:
 - 1. Terminate all conductors on distribution or utilization equipment as indicated.
 - 2. Strip insulation per manufacturers' instructions.
 - 3. Where equipment is not furnished with manufacturer's lugs, provide properly rated and sized lugs.
 - 4. Where conductors have been oversized due to voltage drop or other requirements and cannot be accommodated under the standard lugs, contractor shall provide larger lugs to fit the conductors.
 - 5. If lugs are not available to terminate the oversized conductors, contractor shall provide in-line (straight) splices at an approved location as close to the termination lugs as possible. Conductor size shall be reduced at the splice to the maximum size which the lug can accommodate.
 - 6. In no case shall the conductors be reduced to a size rated less than the feeder or circuit overcurrent protection.
 - 7. Removal of individual conductor strands is not permitted.
 - 8. Where feeders contain conductor quantities which exceed the available lugs, contractor shall provide larger lugs to accommodate the additional conductors.
 - 9. If lugs are not available the installed conductor quantity, contractor shall provide splices at an approved location (external to the equipment), but as close to the termination lugs as possible. Conductor quantities shall be reduced at the splice to the maximum number which the lug can accommodate.
- G. Wiring at Outlets: Install with at least 12 inches of slack conductor at each outlet.
- H. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, per manufacturer's published torque values or per UL 486A.
- I. Use of Aluminum Conductors:
 - 1. Not Permitted

J. AC & MC Cable Installation Requirements:

1. Installed concealed in finished areas.
2. Do not expose, except for final connections to modular furniture.
3. Group all AC/MC cables running together in bundles with nylon cable ties.
4. Route bundles neatly through ceiling cavities.
5. In high ceiling, or large plenum areas, install all AC/MC cables in groups, tight to underside of deck, within steel joist webbing.
6. Avoid constant changes in direction and elevation of bundles.
7. Install perpendicular and parallel to column lines, except for final separation from bundles.
8. Support bundles at regular intervals, per NEC, independent from ceiling hanger wires.
9. Provide adequate clearance above accessible ceiling tiles, minimum of 18."
10. Where circuits exit panelboards not located in electrical rooms or closets, conductors shall be installed in EMT conduit to a wire trough above the panel and finished ceiling, in an accessible location. AC/MC cable shall then be permitted to extend to the branch circuit devices.
11. Where circuits exit panelboards located in electrical rooms or closets, conductors shall be installed in EMT conduit to a wire trough outside the electric room, above the finished ceiling in an accessible location. AC/MC cable shall then be permitted to extend to the branch circuit devices.

3.3 CONSTRUCTION

- A. Generators, motors, vibrating or rotating equipment shall be stranded copper for all sizes. Solid wire not permitted.

3.4 FIELD QUALITY CONTROL

A. General:

1. Before making tests, complete all connections at panels, fixtures and other equipment.
2. Install fuses and have all wiring continuous from service equipment to utilization outlets.
3. Correct all undesirable ground, open and short circuit conditions.
4. Provide source of temporary power for making tests if normal building power is not available at the time.

- B. Acceptance Testing: Take and record the following readings on systems 600 volts and below:

1. Provide megger tests of all feeder conductors, including ground conductors for the following:
 - a. Service entrance conductors
 - b. Panelboard and dry transformer feeder conductors
 - c. Emergency system feeders including feeders between generators, docking station, ATS', panels, switchboards.
2. Indicate measured Ammeter readings on all phases and neutral of each feeder to indicate balance.
3. Ammeter readings on all phases of each poly-phase motor. Include nameplate

full load current of each motor on data sheet.

C. Test Reports:

1. Certify that all overload devices have been set in accordance with data shown on the drawings and/or manufacturer's recommended setting.
2. Send final certified test reports and Certifications to Architect and Owner for approval, in accordance with Section "Submittals."

3.5 ADJUSTING

A. General:

1. Make and perform all adjustments after building distribution system and all branch circuits are installed and operating.
2. Make all ammeter measurements during regular working hours, when all personnel and equipment are working, to represent typical building conditions.

B. Feeder Balancing:

1. Make adjustments to branch circuit connections within branch circuit panelboards. Balance the load between each phase, as practicable.
2. After branch panels are balanced, perform balancing of phase loads on distribution panels and switchboards.
3. Report ammeter readings before and after adjustments for each panel or switchboard.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid grounding of electrical systems and equipment.
 - 2. Basic requirements for grounding for protection of life, equipment, circuits, and systems.
 - 3. Specialized grounding systems for specific installations.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Section "Common Work Results for Electrical."
 - 2. Section "Vibration & Seismic Controls for Electrical Systems" for special project conditions, supporting products and requirements.
 - 3. Section "Low Voltage Electrical Power Conductors and Cables" for grounding conductors and attachments.
 - 4. Section "Low Voltage Electrical Distribution" for grounding, bonding and interconnection of 600V class distribution equipment.

1.3 SUBMITTALS

- A. Submittal Requirements of this section:
 - 1. Ground Rods.
 - 2. Exothermic Weld materials.
 - 3. Grounding/bonding clamps.

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
- B. Installation Quality: In accordance with recognized trade organizations and standards.
 - 1. NFPA 70, "National Electrical Code."
 - 2. UL 467, "Grounding & Bonding Equipment."
 - 3. IEEE.
 - 4. ANSI/EIA/TIA 607, "Commercial Building Grounding and Bonding Requirements for Telecommunications."
- C. Conform to requirements of local power company, relating to grounding of utility company

transformer pads.

1.5 SEQUENCING

A. General Sequencing:

1. Install all subsurface grounding equipment after completion of grading and excavations to avoid disturbance of components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. A.B. Chance Co.
2. Cooper Power Systems
3. O-Z/Gedney Co.
4. Erico Cadweld
5. Harger

2.2 GROUNDING AND BONDING PRODUCTS

- A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- B. Conductor Materials: Copper.

2.3 WIRE AND CABLE CONDUCTORS

- A. General: Comply with Section "Low Voltage Power Conductors and Cables." Conform to NEC, except as otherwise indicated, for conductor properties, including stranding.
- B. Grounding Electrode Conductor: Stranded cable.
- C. Insulated Ground Wire:
1. Minimum sizes per NEC or larger as indicated.
 2. Quantities and sizes as per drawings.
 3. Green insulation.
- D. Bare Ground Wires:
1. For equipment bonding jumpers, equipment enclosures to the ground bus or lug, bonding conduit grounding fitting, and elsewhere as required.
 2. # 6 AWG minimum for bonding jumpers.
 3. Solid Conductors: Soft or annealed per ASTM B3, "Soft or Annealed Copper Wire."
 4. Stranded copper per ASTM B8, "Concentric Lay Stranded Copper Conductors."

2.4 MISCELLANEOUS CONDUCTORS

- A. Ground Bus: Bare annealed copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.5 CONNECTOR PRODUCTS

- A. General: Listed and labeled as grounding connectors for the materials used.
- B. Pressure Connectors: High-conductivity-plated units.
- C. Bolted Clamps: Heavy-duty units listed for the application.
- D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

2.6 GROUNDING ELECTRODES

- A. Ground Rods:
 - 1. One piece, copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core.
 - 2. Size: $\frac{3}{4}$ inch by 10 feet.

2.7 FLEXIBLE BONDING STRAPS

- A. Flexible grounding/bonding straps for water meter jumpers, raised floor bonding, etc.
 - 1. Flexible, tinned, pure copper braid.
 - 2. Unplated, seamless pure copper rectangular ferrules at each end.
 - 3. Burndy Type B, or equal.

PART 3 EXECUTION

3.1 APPLICATION

- A. Equipment Grounding Conductor Application: Comply with NEC Article 250, "Grounding" for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
 - 1. Feeders and Branch Circuits: Install separate insulated equipment grounding conductors with circuit conductors. Terminate on panelboard or switchboard grounding bus bar, or on ground lug or bus in equipment enclosure, cabinet, etc. Splicing of equipment grounding conductors is not permitted.
 - 2. Panelboards: All equipment grounding conductors shall terminate on a single ground busbar within the equipment enclosure. Bus bar shall be bonded to

- enclosure.
- 3. Nonmetallic Raceways: Provide insulated equipment ground conductor in raceways with each branch circuit unless raceway is designated for telephone or data cables.
- 4. Air Duct Equipment Circuits: Provide insulated equipment grounding conductor to duct-mounted electrical devices operating at 120VAC and above, including humidifiers, air cleaners, heaters, etc. Bond the grounding conductor to each such unit and to the air duct.
- 5. Water Heaters: Provide separate insulated equipment ground conductor to each electric water heater. Bond grounding conductor to water heater and connected piping.

B. Underground Conductors: Bare, stranded copper except as otherwise indicated.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

B. Ground Rods:

- 1. Locate a minimum of two-rod lengths from each other and at least the same distance from any other grounding electrode.
- 2. Interconnect ground rods with bare conductors buried at least 24 inches below grade.
- 3. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated.
- 4. Make connections without damaging the copper coating or exposing the rod steel.
- 5. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated.

C. Metallic Water Service Pipe:

- 1. Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service.
- 2. Connect ground conductors to the main metallic water service pipes by means of ground clamps.
- 3. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings.
- 4. Bond the ground conductor conduit to the conductor at each end.

D. Water Meter Jumpers: Provide braided, flexible bonding straps to connect ground clamps on water meter piping to bypass water meters electrically.

E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

3.3 CONNECTIONS

- A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 - 2. Make connections with clean bare metal at points of contact.
 - 3. Coat and seal connections involving dissimilar details with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
 - 4. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors."
- B. Exothermic Welded Connections:
 - 1. Use for connections to structural steel and for underground connections of conductors and rods.
 - 2. Install at connections to ground rods and plate electrodes.
 - 3. Comply with manufacturer's written recommendations.
 - 4. Re-make any welds that are puffed up or that show convex surfaces indicating improper cleaning.
- C. Conductor Terminations:
 - 1. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs.
- D. Metallic Raceways:
 - 1. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing.
 - 2. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing.
 - 3. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- E. Compression-Type Connections:
 - 1. Use hydraulic compression tools.
 - 2. Use tools and dies recommended by the manufacturer of the connectors.
 - 3. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- F. Moisture Protection:
 - 1. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture

penetration of the insulation and cable.

3.4 REPAIR/RESTORATION

- A. Restore all areas or surfaces disturbed by work of this contract, to pre-existing conditions.
 - 1. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated.
 - 2. Where sod has been removed, replace it as soon as possible after backfilling is completed.
 - 3. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition.
 - 4. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching.

3.5 FIELD QUALITY CONTROL

- A. General:
 - 1. Before making tests, complete all connections at panels, fixtures and other equipment.
 - 2. Install fuses and have all wiring continuous from service equipment to utilization outlets.
 - 3. Correct all undesirable ground, open and short circuit conditions.
 - 4. Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.
- B. Acceptance Testing: Take and record the following readings on applicable systems, as described below:
 - 1. Ground resistance maximum values shall be as follows:
 - a. Building Grounding electrode driven rods:
 - b. Rated 500 kVA and less: 10 Ohms
 - c. Rated >500 kVA: 5 Ohms
 - d. Lightning protection system ground: 5 Ohms
 - e. Lighting pole grounds: 15 Ohms
 - f. Emergency generator local ground: 10 Ohms
 - 2. Feeder Equipment Grounding Conductor Tests:
 - a. Perform test by the 2-point method to verify impedance in the ground system between installed components, including, but not limited to the following:
 - 1) Service Disconnect Switches panelboard or transformer and main grounding busbar.
 - 2) Branch panelboards to feeder source.
 - 3) Dry transformers to primary feeder source.
 - 4) Grounding equipment riser(s) (for transformers) from farthest point to point of connection at building main grounding busbar, switchboard ground, or other source connection point.
 - 3. Neutral-Ground Bond Testing:
 - a. Test distribution system for presence of neutral-to-ground bonds at points other than service entrance and/or separately derived sources.
 - b. Remove permitted N-G bond at point of common coupling, and verify no

- c. continuity between neutral and ground systems.
Record the measured isolation (megohms) between the neutral and ground systems.
- d. Where continuity is found, provide further investigation to locate and remove such bonds.

3.6 ADJUSTING

A. General:

1. Make and perform all adjustments after all building grounding systems are complete.

B. Deficiencies of Service or Building Ground Systems:

1. Where ground resistance exceeds specified values, notify the Architect immediately.
2. Modify the grounding system to reduce resistance values.
3. Provide additional ground rods, interconnected with the others, installed at least 10 feet between rods.
4. Retest ground resistance after modifications.
5. Where values still exceed those specified, the Architect will provide additional direction.

C. Unintentional Bonding of Grounds, Neutrals, etc. of Service or Building Ground Systems:

1. Perform additional testing and measurements to locate the unintentional bonds.
2. Remove unintentional bonds.
3. Retest system(s) to prove desired isolation of systems.

D. Reports:

1. Prepare test reports, certified by the testing organization, of the ground resistance at each test location.
2. Include observations of weather and other phenomena that may affect test results.
3. Indicate measures taken to improve test results.
4. Provide all final measurements of system isolation tests (megohms).

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section Includes:

1. Conduits.
2. Conduit fittings and supports.
3. Wireways.
4. Multi-outlet assemblies.
5. Device and outlet boxes.
6. A/V Wall Connection boxes.
7. Pull and splice boxes.
8. Floor mounted devices.

- B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section "Common Work Results for Electrical."
2. Section "Grounding & Bonding for Electrical Systems" for coordination with grounding equipment and attachments.
3. Section "Low Voltage Electrical Power Conductors and Cables" for conductors to be installed in raceways.

1.3 SUBMITTALS

- A. Submittal Requirements of this section:

1. Conduits.
2. Multi-outlet assemblies.
3. A/V wall connection boxes.
4. Floor mounted devices.

- B. Descriptive Data:

1. To verify specifications have been met/exceeded.
2. Indicate UL listing for all products.
3. Manufacturer's specifications, data sheets.
4. Catalog cuts.
5. Dimensional drawings.
6. Capacity ratings.
7. Information required indicating contract compliance.
8. Clearly indicate the exact size or rating proposed.

- C. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements.

1.4 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT

- A. Packing, Shipping, Handling and Unloading:
 - 1. Transport and handle all equipment to prevent bending, distortion or damage to products.
- B. Storage and Protection:
 - 1. Store all materials out of rain.
 - 2. Protect from physical damage.
 - 3. Guard against nicks and scratches on finished surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide the named "Basis of Design" manufacturer and model ("Basis of Design" fixtures are indicated on the drawing fixture schedule), or a comparable product of one of the other following named manufacturers:
 - 1. Steel Conduits & Fittings:
 - a. Allied Tube & Conduit
 - b. American Electric/Steel City
 - 2. Non-Metallic Conduits & Fittings:
 - a. Carlon
 - b. Cantex
 - 3. Surface raceways & Multi-outlet assemblies:
 - a. Wiremold
 - b. MonoSystems, Inc.
 - c. Hubbell
 - 4. Floor mounted devices:
 - a. Wiremold
 - b. Hubbell
 - c. MonoSystems, Inc.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Galvanized Steel Conduit (RGS):
 - 1. ANSI C80.1 Rigid Steel Conduit, Hot dip Galvanized
 - 2. UL 6 Electrical Rigid Metal Conduit - Steel.
 - 3. Meets NEC Article 344, "Rigid Metal Conduit."
 - 4. Material: Steel heavy-wall, hot dip galvanized inside and outside.
 - 5. Joints: Standard pipe thread; furnished with coupling; shipped with thread protector through 2-inch size.
 - 6. Minimum Size: 3/4 inch.
- B. Intermediate Metal Conduit (IMC):

1. ANSI C80.6 Intermediate Metal Conduit - Zinc Coated.
2. UL 1242 Intermediate Metal Conduit.
3. Meets NEC Article 342 Intermediate Metal Conduit.
4. Material: Steel only, intermediate wall thickness, hot dipped galvanized.
5. Joints: Standard Pipe Thread, furnished with coupling, shipped with thread protector through 2-inch size.
6. Minimum Size: 3/4 inch.

C. Electrical Metallic Tubing (EMT):

1. ANSI C80.3 Electrical Metallic Tubing - Zinc Coated.
2. UL 6 Rigid Metal Conduit.
3. Meets NEC Article 358, "Electrical Metallic Tubing."
4. Material: Steel, thin-wall, electro-galvanized.
5. Minimum Size: 3/4 inch.

D. Flexible Metal Conduit (Greenfield):

1. UL 1 Flexible Metal Conduit.
2. Meets NEC Article 348, "Flexible Metal Conduit."
3. Material: Electro-galvanized, or zinc-coated steel.
4. Minimum Size: 3/4 inch.

E. Liquid tight Flexible Metal Conduit (Sealtite):

1. UL 360 Liquidtight Flexible Steel Conduit.
2. Meets NEC Article 350, "Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit."
3. Flexible steel conduit with PVC jacket.
4. Galvanized flexible steel core.
5. Extruded PVC jacket, gray or black.
6. Minimum Size: 3/4 inch.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Rigid Nonmetallic Conduit (RNC):

1. Schedule 40 or 80 PVC.
2. Meeting NEMA publication TC-2, "Electrical Plastic Tubing" (EPT) and "Conduit" (EPC-4 and EPC-80).
3. UL-651 Schedule 40 and 80, "Rigid PVC Conduit."
4. Material complies with ASTM D 1784, "Standards for PVC compounds and CPVC compounds."
5. Meets NEC Article 352, "Rigid PVC Conduit."

2.4 CONDUIT FITTINGS

- A. All fittings to match conduit material and to be suitable for the purpose intended. All fittings shall be UL Listed.
- B. Hazardous Location seal off fittings:

1. Compound filled, malleable iron.
 2. Class & Division as required
 3. 40% fill capacity.
 4. Listed under UL 886, "Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations", vertical or horizontal application, as required.
 5. Crouse Hinds, OZ Gedney, Killark.
- C. Expansion Fittings:
1. Weather tight construction.
 2. Copper braid bonding strap & clamps.
 3. Crouse Hinds, or equal.
- D. RGS/IMC Fittings:
1. Threaded with insulated bushings.
 2. Galvanized steel or malleable iron.
 3. Double locknuts.
 4. Crouse Hinds, Steel City, Bridgeport, or equal.
- E. EMT Fittings:
1. Compression type "Concretight" or "Raintight."
 2. Zinc plated steel body and steel nut.
 3. Insulated throats.
 4. Setscrew fittings not permitted.
- F. Sealtite Conduit Fittings:
1. Threaded ferrule, malleable iron compression nut and body.
 2. Nylon sealing ring.
 3. NEMA FB-1, "Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies."
- G. Flexible Metal Conduit/MC Cable Fittings:
1. 360° squeeze type.
 2. Malleable iron or cast zinc bodies.
 3. Insulated throat.
 4. Anti-short bushings
- H. PVC Conduit Fittings:
1. Formed PVC, sunlight and UV resistant, UL Listed.
 2. Schedule 40 or 80 to match conduit or tubing type and material.
 3. Material complies with ASTM D 1784, "Standards for PVC compounds and CPVC compounds."
 4. Meets NEC Article 347, "Rigid Nonmetallic Conduit."
 5. Meeting NEMA publications TC-3, "PVC Fittings for use with Rigid PVC Conduit and Tubing."
 6. Fittings Listed under UL-514B, "Fittings for Cable and Conduit."
 7. Medium voltage underground or sub-slab conduit systems:
 - a. Minimum 36" bend radius for all conduit turn-ups into gear or pads.

- b. 25 ft radius, long-sweep bends for all bends and offsets in underground or sub-slab runs.
- c. End bells with smooth, flared ends for all conduits terminating under pad-mounted switchgear, switchboards, transformers, etc.
- 8. Conduit and elbows with factory belled end.
- 9. Carlon Plus 40 conduit and fittings, or equal.

2.5 CONDUIT SUPPORTS

- A. Single suspended feeder conduit:
 - 1. 1/2" - 2" Conduit: Adjustable hangers with 3/8" rods.
 - 2. > 2" Conduit: Adjustable hangers with 1/2" rods.
 - 3. Kindorf C-149 or C-150, B-line, or equal.
- B. Groups of suspended conduits:
 - 1. Steel channels with conduit straps.
 - 2. 1/2" threaded rods, minimum.
 - 3. Kindorf, B-Line, or equal.
- C. Flexible metal conduit, MC Cable:
 - 1. UL Listed Caddy Clips, or similar attachment methods.
- D. Surface mounted conduit:
 - 1. 1 or 2-hole pipe straps.

2.6 WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.
- C. Wireway Covers: Hinged type, secured with stainless steel screws.
- D. Finish: Manufacturer's standard enamel finish, ANSI 49 or 61 gray.
- E. NEMA Rating:
 - 1. NEMA 1 for dry, indoor locations.
 - 2. NEMA 3R for outdoor or areas exposed to weather or severe moisture.

2.7 SURFACE RACEWAYS & MULTI-OUTLET ASSEMBLIES

- A. General Construction
 - 1. Steel construction, ivory, scratch resistant finish.
 - 2. Two-piece, separable base and coverplate.
 - 3. Complete with entrance junction boxes, wire retainer clips, device brackets, end

plates, etc.

- B. Divided, 2-compartment metal raceway.
 - 1. Separate power and low voltage compartments.
 - 2. Power outlets of NEMA type and locations per drawings.
 - 3. Duplex RJ-45, snap-in data/voice jacks in LV compartment, where indicated, as specified in Section "Structured Cabling."
 - 4. Metallic device coverplates. Ends cut flush and tight to adjacent raceway cover ends.
 - 5. With manufacturer's precut corners, endplates, and fittings.
 - 6. Wiremold V4000 Series (white finish).

2.8 DEVICE & OUTLET BOXES

- A. Indoor boxes - zinc-coated or cadmium plated steel, NEMA OS-1.
- B. Wiring device boxes for surface mounting in unfinished spaces:
 - 1. Full-size (4" high) boxes required for all wiring devices (switches, outlets, etc.). 3"x2" switch boxes, handy boxes or other reduced-size boxes are not permitted. One-piece, zinc-coated drawn steel, NEMA OS-1.
 - 2. Square boxes with rounded corners and no sharp, protruding edges.
 - 3. Knockouts on all four sides.
 - 4. Pre-drilled mounting holes, and ground wire screw holes.
 - 5. Raised device coverplates for switches or outlets, as required. T&B RS Series.
 - 6. Thomas & Betts, or equal.
- C. Unheated, "damp" and "wet" locations and outdoor locations:
 - 1. NEMA 4 cast-aluminum, cast steel or cast iron.
 - 2. Threaded hubs for surface mounted boxes.
 - 3. "White metal" boxes rated NEMA 4 are not acceptable.
 - 4. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. Outlet boxes in un-plastered brick or block walls shall be provided with deep square-cut device covers.
- E. Surface boxes in prisoner-accessible locations:
 - 1. NEMA 4 cast steel or cast iron.
 - 2. No exposed or accessible knockouts or unused threaded hubs.
 - 3. Threaded hubs for surface mounted boxes. Single or multi-hubs as required.
 - 4. "White metal" boxes rated NEMA 4 are not acceptable.
 - 5. Stainless steel tamper-proof hardware as specified elsewhere.
 - 6. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- F. All boxes sized to meet the requirements of the NEC.
- G. Provide "stud-to-stud" or "dual box to stud" mounting brackets to insure all adjacent boxes are level. Thomas & Betts, or equal

- H. Furnish all boxes with appropriate covers.
- I. No sectionalized boxes shall be used.

2.9 JUNCTION AND PULL BOXES

- A. Dry locations:
 - 1. 12 gauge galvanized sheet steel minimum.
 - 2. Flat covers secured in position by round head brass or stainless steel 300 grade machine screws.
 - 3. NEMA OS-1, "Sheet Steel Outlet Boxes, Covers and Box Supports."
- B. Exterior and wet locations:
 - 1. Cast aluminum or galvanized cast-iron type.
 - 2. Threaded hubs.
 - 3. Gasketed screw-on cover plates.
 - 4. NEMA FB-1, "Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies."
- C. Boxes imbedded in concrete:
 - 1. NEMA 4X PVC.
 - a. Glue-in conduit hubs.
 - b. Gasketed coverplates.
 - c. Sunlight (UV) resistant.
- D. Surface boxes in prisoner-accessible locations:
 - 1. NEMA 4 cast steel or cast iron.
 - 2. No exposed or accessible knockouts or unused threaded hubs.
 - 3. Threaded hubs for surface mounted boxes. Single or multi-hubs as required.
 - 4. "White metal" boxes rated NEMA 4 are not acceptable.
 - 5. Stainless steel tamper-proof hardware as specified elsewhere.
 - 6. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. All boxes sized to meet the requirements of the NEC.

2.10 RECESSED A/V WALL BOXES

- A. Provide recessed wall boxes for concealed power and low voltage cabling connections to wall mounted flat panel TV's, flat screens, etc., where indicated.
 - 1. Recessed main body, designed to fit within 2x4 stud wall construction.
 - 2. Top and bottom concentric conduit knockouts for (1) $\frac{3}{4}$ " to 1-1/4" and (1) 1-1/4" to 2".
 - 3. Feed-thru side tunnels for passing power or LV cabling thru housing.
 - 4. Removable dividers for separating power and low voltage devices/cabling.

5. Removable interior device module designed to accept two (2) standard 2x4 wiring devices and coverplates.
6. Wiring device locations shall accept power, A/V, data or other connectors using standard 2x4 box mounting. No proprietary wiring devices or mountings.
7. Front paintable trim ring, and decorative cover to conceal devices/plugs, with room to pass cables out to flat panel.
8. U.L. Listed.
9. Wiring devices, as specified elsewhere.
10. Wiremold Evolution Series (#EFSB2) wall boxes, or comparable product.

2.11 FLOOR MOUNTED DEVICES (POKE-THRU TYPE)

A. Poke Through Floor Outlets – 4" Diameter, 2-gang devices.:

1. Mounted in 4" core drilled hole in slab.
2. Recessed device mounting below hinged cover.
3. Capacity for 2-gangs of devices.
4. Fitted with duplex 20 amp power receptacles, flush service head.
5. Low voltage ports with Cat 5E RJ45 jacks, per IT design drawings.
6. Integral fire and smoke barrier – 2-hour rated.
7. Separate low voltage and power raceways.
8. Flush hinged metal cover. Operable without tools.
9. Slide plates to allow cable passage with cover closed.
10. Satin nickel, satin brass or brushed aluminum finish to be selected by architect.
11. ADA compliant.
12. LeGrande Wiremold Evolution 4" Series Poke-Thru, or approved equal.

2.12 FLUSH MULTI-SERVICE FLOOR BOXES

A. Complete in-floor multi-service box consisting of floor box housing, flush removable cover, and wiring devices, as specified, all fittings, materials and labor.

1. Adjustable leveling and placement during rough in to accommodate structural and architectural elements, and other equipment.

B. Construction:

1. Galvanized steel per ASTM 525 G-60.
2. Concrete-tight for in-floor use.
3. Hinged access lid with grommeted cable ports to allow lid closure with receptacles in use.
4. UL scrubwater compliant.
5. ADA compliant.
6. Adjustable legs for leveling and adjustment prior to pour.
7. Knockouts for conduit entry and feed through use.
8. 4 compartment box, individually sectionalized.
9. 2 - Duplex 5-20R power receptacles.
10. 2 - Duplex data RJ45 jacks, Category 5E.
11. UL Listed, with separation of power and low voltage.
12. Completely flush, rectangular, brass cover with hinged access lids. Floor covering trim, as required.

C. Wiremold RFB4 Multi-service steel recessed floor boxes or MonoSystems Concrete Floor

Boxes, or comparable product.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine areas to receive cable trays. Make adjustments to elevations, routing, etc. to coordinate with other work including beams, lights, ducts, pipes, etc.

3.2 APPLICATION

A. General Exterior Conduit Applications:

- | | | |
|----|---------------------------------|----------|
| 1. | Direct buried: | PVC, RGS |
| 2. | Concrete ductbank: | PVC |
| 3. | Above grade, building surfaces: | IMC, RGS |
| 4. | Roof surfaces: | IMC |
| 5. | Below covered roofs/overhangs: | IMC, EMT |
| 6. | Motors, pumps, etc. | Sealtite |

B. General Interior Conduit Applications:

- | | | |
|----|---|---------------|
| 1. | All panelboard or ATS feeders: | |
| | a. Above slab: | EMT |
| | b. Below floor slab: | RGS, PVC* |
| | 1) *RGS required where conduit penetrates through slab. | |
| 2. | HVAC equipment circuits: | |
| | a. (>30 amps): | EMT |
| | b. (≤ 30 amps): | EMT, MC Cable |
| | c. Below floor slab: | RGS, PVC* |
| | 1) *RGS required where conduit penetrates through slab. | |
| 3. | Branch circuits (lighting, receptacles): | |
| | a. Above accessible ceilings: | EMT, MC Cable |
| | b. Above inaccessible ceilings: | EMT, MC Cable |
| | c. Concealed in CMU walls: | EMT, PVC |
| | d. Within solid masonry walls: | EMT, PVC |
| | e. Concealed within stud walls: | EMT, MC Cable |
| | f. In or below slab on grade to flush floor boxes: | PVC |
| 4. | Final Connections to Lights, dry transformers, small motors, vibrating equipment: | |
| | a. Indoor, dry locations: | Greenfield |
| | b. Outdoor, damp locations: | Sealtite |
| 5. | All prisoner accessible areas: | |
| | a. Above accessible ceilings: | EMT, MC Cable |
| | b. Above inaccessible ceilings: | EMT, MC Cable |
| | c. Surface mounted: | IMC, RGS |

3.3 INSTALLATION

A. General:

1. Coordinate layout and installation of all raceways, cable trays, boxes and other equipment with other construction elements to ensure adequate headroom, working clearance, and access and to eliminate interference problems.
2. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
3. Do not cut or drill structural members without permission of Architect. Provide reinforcing for opening as directed by Architect.
4. Pierce metal deck where required for installation of electrical equipment.
5. Support raceways and equipment as required by NEC, manufacturers, and as specified elsewhere.
6. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer.
7. Tighten connectors and terminals, including screws and bolts, per manufacturer's published torque values, or per UL 486A, "Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors" where not specified.

B. Tamper Proof Hardware

1. Provide tamper proof hardware for all panels, pullboxes, junction boxes, coverplates, and any other equipment or items accessible to prisoners, as indicated on the drawings.

3.4 CONSTRUCTION

A. Flexible Connections: Use maximum of 6 feet of flexible conduit for connections to equipment subject to vibration, noise transmission, or movement, and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections. Provide flexible connections as follows:

1. Connections to motors between rigid conduit and connection box on motor.
2. Connections to equipment containing motors (power and control conduits).
3. Connections to generators (ALL power, control and monitoring conduits).
4. Connections to equipment subject to movement, rotation, vibration or oscillation.
5. Connections from rigid conduit system to recessed lights.
6. Connections to dry-type transformers.
7. Other applications, as indicated.

B. Supports: Provide all supports, hangers, braces and attachments required for the work of this section.

3.5 CONDUIT INSTALLATION

A. General Installation Requirements:

1. Install all conduit concealed, unless not possible.
2. Surface mounting only as approved by Architect.
3. Minimum size 3/4" inch, unless noted otherwise.
4. Minimum 6" clearance from flues, heating pipes, or other hot surfaces above 80°F.
5. Parallel and perpendicular to walls, structural members, ceilings and interior surfaces; install plumb.

6. Polypropylene or nylon pull line in each empty conduit.
 7. Use capped bushings or plugs during construction.
 8. Clean and cap all conduits left empty for future use.
 9. In masonry, install prior to wall construction and accurately set all outlets.
 10. Where conduit passes through exterior walls, floor or roof, install appropriate fittings and materials to make openings watertight. Repair pierced vapor barriers vapor-proof. Provide flashing for each conduit piercing the roof.
- B. Exposed Conduit in Exposed Ceiling Areas:
1. Install all conduit tight to underside of deck, above all ducts, piping, etc.
 2. Install conduits within joist webbing and through spaces between steel beams and structure, as high as possible.
 3. Install parallel with building walls, beams and main structural elements.
 4. Minimize offsets by coordinating with other trades prior to installation.
 5. Install pull and junction boxes where least visible. Install on far side of ducts, etc., as visible from the majority of room viewpoints.
- C. Raceways Embedded in Slabs: Install in slabs only where explicitly shown on drawings. Install in middle third of the slab thickness where practical, and leave at least 1" inch concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Run conduit larger than 1" inch trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.
 4. Transition rigid nonmetallic conduit to rigid galvanized steel (RGS) conduit before rising above floor slab.
 5. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
 6. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6" inches above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.
- D. Flexible Conduit Installation Requirements:
1. Group all flexible conduits running together in bundles with nylon cable ties.
 2. Route bundles neatly through ceiling cavities.
 3. Avoid constant changes in direction and elevation of bundles.
 4. Install perpendicular and parallel to column lines, except for final separation from bundles.
 5. Support bundles at regular intervals, per NEC, independent from ceiling hanger wires.
 6. Provide adequate clearance above accessible ceiling tiles, minimum of 18."
 7. Where flexible conduit or MC cable is used for final connections to motors, lights, etc., maximum length shall be 6 feet.
- E. Installation in Prisoner Cells and All Areas Accessible to Prisoners.

1. Surface Installations:

- a. All conduit connections shall be threaded for connections of IMC or RGS conduits.
- b. Conduits shall be strapped to wall with 2-hole straps within 2 ft of each termination into box, etc.
- c. Conduit runs shall be attached to masonry surfaces every 8-10 LF with 2-hole pipe straps.

F. Fittings & Terminations:

1. Provide expansion fittings in all conduit where crossing building expansion joints.
2. Provide expansion fittings in all runs of PVC conduit, a minimum of 1 between every 2 fixed points.
3. Tighten compression fittings within wrenches.
4. Terminations: Use two locknuts, one inside and one outside the box. Provide insulated bushings or throats.
5. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
6. Sealing Fittings: Install per manufacturer's instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings on conduit at the following points and elsewhere as indicated:
 - a. Entering/leaving hazardous locations.
 - b. Where otherwise required by the NEC.

3.6 WIREWAY INSTALLATION

- A. Install per NEC Article 362. Provide hinged connectors to join adjacent lengths. Connect all sections solidly to insure effective grounding of wireway system.
- B. Mount wireway in accessible location, with hinged section facing in proper direction.
- C. Use standard manufactured lengths to fit in available space. Do not cut standard lengths in field. Provide cut-off fitting where non-standard length is required, and cut in field as required.
- D. Clear all obstructions encountered in field. Provide offsets and appropriate fittings as required to clear obstructions.
- E. Provide closing plate at ends of wireway. Install wire retainers in wireway after conductors are in place. Provide adapter where wireway is connected to box and cabinet.
- F. Use 12" section of wireway to pass through wall, to allow maximum accessible length on each side. Provide special escutcheon plate on each side of wall to finish opening neatly.

3.7 SURFACE RACEWAY & MULTI-OUTLET ASSEMBLY INSTALLATION

- A. General:

1. Install level and plumb.
2. Install tight to mounting surface.
3. Cut ends of all raceways perpendicular. Leave no sharp edges or burrs.
4. Provide separate low voltage and power feeds to all multichannel raceways.
5. Securely mount wiring devices into raceways.
6. Provide manufacturer's wire retaining clips to secure wires.
7. Provide manufacturers fittings for all corners, box entries, etc.

3.8 DEVICE & OUTLET BOX INSTALLATION

A. General Requirements:

1. Install all boxes plumb and level.
2. Install boxes at heights required. Refer to Section "Wiring Devices."
3. Install recessed boxes flush with final finished surface.
4. Secure all boxes such that no movement occurs during normal use.
5. Install ceiling mounted boxes with sufficient support and rigidity to prevent movement during normal connecting and disconnecting procedures.
6. Install power and low voltage device boxes at same heights from floor or counters.
7. Consistent Mounting Heights: Provide installation of boxes at the same and consistent mounting heights throughout project. Where multiple switch boxes or power and low voltage boxes are installed in close proximity, use "stud-to-stud" or "dual box to stud" mounting brackets to insure all boxes are level.

B. Installation in Prisoner Cells and All Areas Accessible to Prisoners.

1. Recessed Installations:
 - a. Where installed in concrete, CMU or other masonry wall construction, box openings shall be carefully cut to size with no noticeable play or gaps.
 - b. Fill all voids behind and around boxes so that masonry prevents any and all movement in the box and attaching conduits.
 - c. Boxes shall be precisely set to the exact depth so that NO gaps exist between coverplate and wall surface, or between coverplate and box.
 - d. All box covers, coverplates or devices shall be attached via stainless steel tamper-proof screws as specified elsewhere.
2. Surface Mount Installations:
 - a. Install backboxes, junction boxes and other device mounting boxes with minimum of two (2) concrete anchors per box.
 - b. All conduit to box connections shall be threaded for connections of IMC or RGS conduits.
 - c. Boxes shall be installed tight to surface with no voids behind box.
 - d. Conduits shall be strapped to wall with 2-hole straps within 2 ft of each termination into box, etc.
 - e. All box covers, coverplates or devices shall be attached via stainless steel tamper-proof screws as specified elsewhere.

3.9 RECESSED A/V WALL BOX INSTALLATION

A. A/V Wall Boxes:

1. Install boxes plumb and level.
2. Coordinate installed boxes heights with proposed flat panel TV's, etc. such that wall box is fully concealed by flat panel.
3. and.
4. Coordinate recessed box location and concealed conduit with flat panel mounting brackets and support blocking to avoid interference with flat panel mounting bracket(s)
5. Install recessed boxes flush with final finished surface.
6. Install power (3/4") and low voltage (2") conduits from ceiling cavity and or floor, per drawings.
7. Install power and low voltage wiring devices in wall box. Refer to Section "Wiring Devices."

3.10 FLOOR MOUNTED DEVICE BOX INSTALLATION

A. Floor Mounted Devices - General:

1. Set floor boxes level and adjust to floor surface.
2. Make adjustments in fittings, lengths and placement during rough in to accommodate structural and architectural elements, and other equipment.
3. Coordinate exact locations and orientation with Owner prior to concrete pour.

B. Poke Through Floor Outlets:

1. Provide core-drilled hole in slab, size per outlet manufacturer.
2. Mount device flush in slab.

C. Flush In-Floor Device Boxes:

1. Set boxes prior to concrete pour.
2. Coordinate exact positions with Architect, Owner and related equipment.
3. Provide separate conduit connections for power and low voltage sections.
4. Protect housing with cover during concrete pour.
5. Adjust for final height and make level after pour.
6. Set trim rings and covers, adjust for flush fit with final floor covering or finish.

3.11 REPAIR/RESTORATION

- A. Restore all finishes, equipment and surfaces to original condition, where affected by the work of this section.

3.12 CLEANING

A. General:

1. Remove paint splatters and other spots, dirt, and debris.
2. Touch up scratches and marred finishes to match original finishes.
3. Clean front of all coverplates, etc. using methods and materials recommended by manufacturer.

GLEN ARM SIGN AND SIGNAL SHOP – HVAC
SYSTEM REPLACEMENT
BALTIMORE COUNTY, MARYLAND
JOB ORDER NUMBER - 0001042031

PROJECT MANUAL
100% Construction Documents
1-17-25

END OF SECTION

SECTION 26 20 00

LOW VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section includes:
 - 1. Automatic Circuit Breakers
 - 2. Disconnect Switches
- B. Related Sections:
 - 1. Section "Underground Ducts and Raceways For Electrical Systems" for coordination with connecting buried conduits, manholes, etc.
 - 2. Section "Lightning Protection For Structures" for bonding and interconnection of electric service equipment.
 - 3. Section "Common Work Results for Electrical" for concrete pads, bollards, labeling, and other general requirements.
 - 4. Section "Grounding & Bonding for Electrical Systems" for grounding and bonding requirements.
 - 5. Section "Low Voltage Power Conductors and Cables" for 600V conductors.
 - 6. Section "Commissioning of Electrical Systems" for specific commissioning and functional performance testing requirements.

1.3 SUBMITTALS

- A. Submittal Requirements of this section:
 - 1. Automatic Circuit Breakers & Enclosures
 - 2. Disconnect Switches
- B. Product data: Include dimensions, construction, materials, performance data, etc.
- C. Provide submittal data for each product type.
 - 1. To verify specifications have been met/exceeded.
 - 2. Independent laboratory test data where requested.
 - 3. Clearly indicate or state all options, etc.:

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the National Electrical Code,

Article 100.

2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.
3. Where equipment consists of multiple components, the entire assembly or product shall be UL Listed and Labeled or Labeled by a testing organization acceptable to the Authority Having Jurisdiction per the NEC.

B. Single-Source Responsibility:

1. The complete performance of assembled panelboards and/or switchboards, including all integral accessories, shall be the sole responsibility of the equipment supplier. It is the installer's responsibility to ensure that all factory and field installed accessories and loose components used in the system, meet these specifications, and perform up to the stated and tested standards.

C. Manufacturer/Vendor Requirements:

1. Coordinate the components of the system and their arrangements electrically and mechanically.
2. Manufacturer shall be experienced in manufacturing equipment of the types and capacities indicated that have a record of successful in-service performance for a minimum of 10 years.
3. Maintain, within 50 miles from site, a maintenance and service organization complete with parts inventory and repair facility. Service shall be available on a 24-hour basis.
4. Start-up services and post installation tests, as specified.

D. Installation Quality: In accordance with recognized trade organizations and standards.

- | | | |
|-----|---------|---|
| 1. | ANSI | American National Standards Institute |
| 2. | ASME | American Society of Mechanical Engineers |
| 3. | ASTM | American Society for Testing and Materials |
| 4. | IEEE | Institute of Electrical and Electronics Engineers |
| 5. | IEEE C2 | National Electrical Safety Code |
| 6. | NEC | National Electrical Code |
| 7. | NECA | National Electrical Contractors' Association " <i>Standards of Installation</i> " |
| 8. | NEMA | National Equipment Manufacturers Association |
| 9. | NETA | National Electrical Testing Association |
| 10. | NFPA | National Fire Protection Association |
| 11. | UL | Underwriter's Laboratories |

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Provide all transportation of equipment to site.
2. Provide for rigging needed for unloading and setting large panels or switchboards into final position.

B. Storage and Protection:

1. Where unit is to be installed indoors, without enclosure, store in covered building

- or offsite to prevent exposure to weather, etc.
- 2. Apply temporary heat according to manufacturer's recommendations within enclosure of each switchgear or switchboard section throughout periods during which equipment is not energized and is not under normal control of temperature and humidity.

1.6 PROJECT CONDITIONS

A. Electrical service to the facility:

- 1. 480Y/277 volt.
- 2. 3 phase, 4 wire.
- 3. Grounded wye.

1.7 SEQUENCING

A. General Sequencing:

- 1. Coordinate panelboard installation with exterior and/or interior construction.
- 2. Provide for sub-grade or subslab roughins.
- 3. Provide positioning and roughins such that required clearances are maintained after final installation.

1.8 WARRANTY

A. Special Warranty: Extended product warranties over and above that required by General Conditions of this contract.

- 1. Warranty shall be by the product manufacturer(s), as identified in each product specification.
- 2. Warranty includes all parts, labor, travel expenses, with no deductibles.
- 3. Installer/contractor shall complete and file all necessary documents with manufacturer, etc. to assure fulfillment of warranty requirements.
- 4. Deliver all extended warranty documents to Owner in O & M manuals with each product.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, provide a system by the named "Basis of Design" manufacturer, or a comparable product of one of the other following named manufacturers:

- 1. Automatic Circuit Breakers & Enclosures:
 - a. Match Existing Panel Manufacturer.
- 2. Safety Disconnect Switches:
 - a. Square D/Schneider Electric (basis of design)
 - b. ABB (GE)
 - c. Eaton - Cutler-Hammer
 - d. Menekes

2.2 AUTOMATIC CIRCUIT BREAKERS

- A. UL Listed, automatic circuit breakers for installation within panelboards and switchboards, or with enclosed cabinets and trim.
- B. Circuit breakers:
 - 1. Molded case, thermal magnetic, inverse time, unless noted otherwise.
 - 2. Adjustable magnetic trip settings for thermal-magnetic breakers ≥ 225 amps.
 - 3. Ratings as per drawings.
 - 4. Accessories, as noted.
 - a. Mechanical kirk key interlocking.
 - b. Under-voltage trip.
 - 5. Arc Flash Energy-Reduction Maintenance Switch: Per NEC 240.87, provide a manual switch that changes the trip settings on any adjustable trip breaker (with available trip settings of 1200A or higher) so as to minimize arc flash energy to downstream devices when active by lowering the instantaneous trip to the lowest possible setting. Provide with visual status indicator light on the breaker that indicates breaker is in Maintenance Mode.
 - 6. Solid state electronic trip units for ground fault, long time pick-up and delay, short time pick-up and delay and instantaneous settings, where indicated. All breakers identified on drawings, or specified herein as having Electronic Trip Units (ETU) shall have the following features:
 - a. Long Time Pickup and Delay.
 - b. Short Time Pickup and Delay.
 - c. Instantaneous.
 - d. Ground Fault Pickup & Delay.
 - e. Zone Selective Interlocking on Short Time and Ground Fault.
 - f. True RMS sensing.
 - g. Adjustable setpoints via clearly marked dials.
 - h. Clear lexan cover to seal adjustable settings from tampering or accidental contact.
 - i. Square D MicroLogic 6.0 Electronic Trip Units or product of comparable named manufacturer.
 - 7. UL Listed Service Entrance use, where required.
 - 8. Square D or comparable product from named manufacturers.
 - 9. Where distribution system breakers have zone interlocking for selective coordination, all interlocked breakers shall be by the same manufacturer to insure proper communication and operation of the zone selective interlocking feature. This shall include the following breakers and locations, as applicable.
 - a. Service entrance breakers.
 - b. Distribution panelboard main and/or feeder breakers.
 - c. Docking station breakers.
 - d. Generator main output breaker(s).
- C. Enclosure and trim:
 - 1. NEMA 1 enclosure, unless noted otherwise.
 - 2. Deadfront cover.
 - 3. Padlock provisions for locking breaker handle in ON or OFF position.
 - 4. Rust-inhibiting phosphatized primer.
 - 5. Factory finish paint (ANSI 61 gray).

2.3 SAFETY DISCONNECT SWITCHES

- A. Provide safety disconnect switches as shown on the drawings and where required by the National Electrical Code.
 - 1. Horsepower rated for motor applications.
 - 2. Solid neutral terminals where applicable.
 - 3. Shielded phase conductor terminals.
 - 4. Heavy duty type; 200kA Interrupting rating.
 - 5. General duty type; 100kA Interrupting rating.
 - a. NEMA 1 for interior.
 - b. NEMA 3R for exterior, damp, or wet locations, on roof or on grade.
 - 6. Cover interlock to prevent operation with cover open.
 - 7. Rejection feature (Class R) fuses, for fused units.
 - 8. Externally operated, with all current carrying parts silver or tin plated. Side handle, quick-make, quick-break operation.
 - 9. Pad-lockable, minimum of 2.
 - 10. Square D, or comparable product by previously named manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Examine the conditions under which the equipment shall be delivered, installed, and operated. Make all allowances required for operation, access and maintenance of the equipment, per Codes and manufacturers.

3.2 INSTALLATION

- A. General Requirements:
 - 1. Install all equipment, as indicated.
 - 2. Maintain minimum working space at live parts according to manufacturer's written instructions and NEC.
 - 3. Provide all required access space per NEC for controls, fuses and items requiring maintenance access.
- B. Rough-in:
 - 1. Roughin all underslab or below grade conduits, ducts, etc. prior to setting panels, switchboards or other equipment in place.
 - 2. Coordinate exact stubups with proposed manufacturer's equipment installation drawings and the work of other trades in this contract.
 - 3. Roughin for all required circuits, controls, connections, etc. as required by proposed equipment, even if not explicitly indicated on plans.
 - 4. Make minor adjustments to locations so as to maintain required front working clearances and clearance above and below per NEC.
- C. Circuit Breaker Installation:
 - 1. Install circuit breakers in panelboards, or with enclosure, as required.
 - 2. GFCI and AFCI circuit breakers: Provide circuits with dedicated neutral conductors. Connect neutral through breaker at panelboards, per manufacturer's instructions.

3. Provide labels on all protected outlet coverplates to indicate “GFCI PROTECTED” or “AFCI PROTECTED”, as applicable.

3.3 CONSTRUCTION

A. Connections to Existing Work:

1. Provide connections between proposed mechanical equipment and existing equipment:
 - a. Panelboards, switchboards, etc.

B. Grounding: Ground switchboards, panelboards, all metallic service and distribution equipment frames and enclosures per NEC and as specified in Section “Grounding & Bonding For Electrical”.

C. Connections: Tighten joints, connectors and terminals, including screws and bolts, in accordance with manufacturer’s published torque tightening values for connectors and bolts. Where manufacturer’s torque requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A, “Wire Connectors and Soldering Lugs for Use with Copper Conductors.”

3.4 REPAIR/RESTORATION

A. Restore all finishes, equipment, surfaces and/or grade to original condition, where affected by the work of this section.

B. Comply with all requirements as specified in Section “Common Work Results For Electrical”.

3.5 FIELD QUALITY CONTROL

A. General:

1. Perform inspections and testing to ensure installation complies with Contract Documents, is operational within industry and manufacturer’s tolerances, is adjusted to specific project parameters, and is suitable for energizing.
2. Acceptance Testing: Provide for acceptance testing of electrical equipment specified in this section, as follows, and as required in Section “Common Work Results for Electrical”.
3. Schedule tests and provide notification at least one week in advance of test commencement.
4. Provide a set of Contract Drawings to the testing agency.
5. Provide manufacturer’s installation and testing instructions to the testing agency.
6. Provide complete shop drawing data on all equipment.
7. Provide written results of all tests. Include date, equipment ID, name of testing company and technician, and results of each individual test. Provide pass/fail indication for each test.

B. Pre-Testing Inspections:

1. Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing. Do not proceed with tests until deficiencies are

- corrected.
- 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, where not available, those of UL Standards 486A and 486B.
- 3. All settings, as specified in this section, shall be properly set and verified prior to equipment testing.

C. Acceptance Testing:

- 1. Panelboard Tests: After installing equipment, perform the following tests, at a minimum:
 - a. Perform insulation resistance tests, phase-phase and phase-ground for all buses and main breaker(s).
 - b. Perform continuity tests of all grounds, and bonded components.
 - c. Perform tests to confirm proper bonding of neutrals to ground, where intended.
 - d. Perform tests to confirm isolation of neutrals and grounds, except at intended locations.
 - e. Perform overpotential tests per ANSI 37.20c.
 - f. Operation of auxiliary contacts and devices.
 - g. Operation of all gauges, displays and control equipment.

D. Ground Fault Sensors and Breakers:

- 1. Test entire GFP system including CT's, wiring, polarity, solid state device operation, and breaker or motor operated switch.
 - a. Test using AC current injection method between each phase, neutral and ground.
 - b. Verify proper operation including breaker trip for all possible ground fault conditions (i.e. Phase-Ground & Neutral-Ground).
 - c. Verify that system does not nuisance trip with single phase (Phase-Neutral) loads, where applicable.
 - d. Test each GFP system and breakers.

E. Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Remove and replace malfunctioning components with new, and retest.

F. Test Labeling: Upon satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to the unit.

3.6 IDENTIFICATION

A. Identify all distribution system components and wiring in accordance with Section "Common Work Results For Electrical".

- 1. Provide engraved nameplate for each individual switchboard, switchgear, panelboard, fusible switch, enclosed breaker, etc. , which identifies the equipment per project nomenclature.
- 2. Meter Stacks: Provide an engraved nameplate for each meter stack meter/main breaker identifying the apartment or dwelling unit served.

B. Provide permanent warning signs on all electrical switchgear, switchboards, on electrical

room doors, and on fenced yards containing such equipment. Warning signs shall be as specified in section "Common Work Results for Electrical".

3.7 ADJUSTING

A. General:

1. Set all field adjustable parameters to those as specified.
2. Set field adjustable pickup and time delay ranges of Ground Fault Systems and solid state breakers as indicated.

3.8 CLEANING

A. General:

1. Inspect interior and exterior of installed equipment and switchgear.
2. Remove paint splatters and other spots, dirt, and debris.
3. Touch up scratches and mars of finish to match original finish.
4. Remove protective films, etc. from all devices, controls, etc.
5. Remove debris, insulation and wire clippings, dirt, etc. from interior of all equipment.
6. Remove dirt, debris, etc. from top of all equipment.

3.9 DEMONSTRATION

A. Owner Demonstrations: Provide a factory trained representative for each system and type of equipment, for the purpose of training owner's personnel:

1. Discuss proper operation, maintenance, and use of all equipment.
2. Demonstrate periodic Owner testing and/or inspection of equipment.
3. Demonstrate adjustment to Owner-accessible equipment and systems.
4. Instructors shall be fully knowledgeable of the installed equipment and all components.
5. Training shall be completed at the project site following Owner occupancy, at Owner's discretion.
6. Schedule after all final tests, adjustments and Owner's acceptance.
7. Training shall consist of a minimum of (4) hours of training and instruction, including use of delivered O&M manuals for each system or equipment.

3.10 COMMISSIONING

A. This project includes Commissioning of selected systems and components. Provide for commissioning of the low voltage distribution system(s), as required per Section "Commissioning of Electrical Systems", and the Commissioning Plan.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Section Includes:

- 1. A/C switches.
 - 2. Receptacles.
 - 3. Connectors.
 - 4. Device plates and covers.

- B. Related Sections:

- 1. Section "Common Work Results for Electrical."
 - 2. Section "Low Voltage Electrical Power Conductors and Cables" for connecting wiring, cables and conductors.
 - 3. Section "Raceways & Boxes for Electrical Systems" in which devices are to be installed.
 - 4. Section "Lighting" for additional low voltage switches, occupancy sensor switches and dimming devices.

1.3 SUBMITTALS

- A. Submittal Requirements of this section:

- 1. A/C switches.
 - 2. Receptacles.
 - 3. Connectors.
 - 4. Device plates and covers.

- B. Product data for each device type:

- 1. Manufacturer's specifications, data sheets.
 - 2. Capacity ratings, NEMA configurations, etc.
 - 3. Information required indicating contract compliance.
 - 4. Device color.
 - 5. UL Listing.

- C. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements, and Section "Common Work Results For Electrical".

1.4 QUALITY CONTROL

A. Product Coordination Responsibility

1. The contractor shall insure that all proposed control and/or dimmer switches are fully compatible and matched with the proposed light fixtures.
2. Contractor shall confirm compatibility of proposed controls/switches with proposed lighting fixtures prior to submitting for approval or ordering.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:

1. Deliver and store wiring devices and accessories according to manufacturers' instructions.
2. Do not store in unheated areas of high humidity, which might create corrosion or other deterioration.
3. Do not store in areas subject to high temperatures, which might cause deterioration or deformation of products.

1.6 SEQUENCING

A. General Sequencing:

1. Sequence installation of devices and equipment of this section such that damage to installed equipment is minimized.
2. Install device plates after all wall finishes have been completed.

B. Electrical Division Sequencing, Coordination, and Integration:

1. Provide installation of wiring devices after supporting raceways and boxes are permanently installed.
2. Provide coordination of proposed wiring devices with actual cord/plug requirements of attached equipment.
3. Match wiring devices to plug connectors for Owner-furnished equipment.
4. Match wiring devices to plug connectors for equipment furnished under other Divisions.
5. Do not install permanently wired flexible connectors and associated cables/service cords until attached equipment is in place.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, provide products by the named "Basis of Design" manufacturer, or a comparable product of one of the other following named manufacturers:

1. Switches & Receptacles:
 - a. Eaton Arrow-Hart Cooper
 - b. Hubbell
 - c. Leviton
 - d. Pass & Seymour

2.2 WIRING DEVICES - GENERAL

- A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices"
- B. Color: WHITE except as otherwise indicated or required by Code.
- C. UL Listed.
- D. All devices shall be of one manufacturer.
- E. Prewired pigtail connectors that accommodate Fed Spec receptacles, GFCIs and switches are approved. Must be crimped and welded terminal right angle application within the connector.
- F. All receptacles in dwelling units and any areas accessible to the public, including exterior locations, shall be of tamper resistant (TR) construction.

2.3 A/C SWITCHES

- A. Toggle Switches:
 - 1. Silent mechanical type rated 20 ampere, 120/277VAC.
 - 2. Fed. Specification #WS896-E.
 - 3. 1-piece Lexan cam and toggle.
 - 4. 20 amp rating.
 - 5. Single pole, 3-way or 4-way, per drawings.
 - 6. Back and side wiring provisions.
 - 7. Arrow-Hart #1991 Series.

2.4 RECEPTACLES

- A. Receptacles:
 - 1. Construction, spec-grade.
 - 2. Duplex NEMA 5-20R, 120 volt, 20 amp, 3 wire, U-ground.
 - 3. Federal Specification #WS596-F.
 - 4. Lexan or nylon body, metal yokes.
 - 5. Arrow Hart #5362.
- B. Ground Fault Interrupting (GFI) Receptacles:
 - 1. Class A, UL943 listed, feed-thru type.
 - 2. Screw terminal connections.
 - 3. GFCI Receptacles shall have SafeLock protection. If critical components are damaged and ground fault protection is lost or if mis-wired, power to receptacle is disconnected.
 - 4. End-of-life provision shall render outlet incapable of delivering power upon failure of GFCI function.
 - 5. Reverse Line Mis-wire: receptacle shall not provide power if the hot and neutral wires are reverse wired.
 - 6. Arrow-Hart #VGF20.
- C. Weather & Tamper Resistant Ground Fault Interrupting (WR-GFI-TR) Receptacles (for exterior use and interior damp/wet locations):

1. Class A, UL943 listed, feed-thru type.
 2. 120VAC, 20 Amp rated. NEMA 5-20R
 3. Screw terminal connections.
 4. GFCI Receptacles shall have Safe-Lock protection. If critical components are damaged and ground fault protection is lost or if mis-wired, power to receptacle is disconnected.
 5. End-of-life provision shall render outlet incapable of delivering power upon failure of GFCI function.
 6. Reverse Line Mis-wire: receptacle shall not provide power if the hot and neutral wires are reverse wired.
 7. UL Listed as "Tamper Resistant" and "Weather Resistant" with identifying "TWR" label.
 8. Arrow-Hart #TWRSGF20, Leviton, Pass & Seymour, Hubbell, or equal.
- D. Weather & Tamper Resistant Duplex Receptacle (TWR) (for exterior use and interior damp/wet locations):
1. Construction, spec-grade.
 2. Duplex NEMA 5-20R, 120 volt, 20 amp, 3 wire, U-ground.
 3. Federal Specification #WS596-G.
 4. Lexan or nylon body, metal yokes.
 5. UL Listed as "Tamper Resistant" and "Weather Resistant" with identifying "TWR" label.
 6. Arrow Hart #TWRBR20.
- E. Controlled Receptacles:
1. All outlets controlled by occupancy sensors, per IGCC Plug Load Control requirements, shall be marked, as required per NEC.
 2. Each plug-position on face of all controlled outlets shall be labelled with "Controlled" and corresponding marking symbol, as applicable.
 3. Dual or Half-controlled outlet construction, as required per drawings.
 4. Tamper Resistant (TR) construction and labelled.
 5. Arrow Hart TR5362-CD (dual), Arrow Hart TR5362-CH (half), or equal.
- F. Special Receptacles:
1. NEMA configurations per drawings.
 2. Specification grade.
 3. Lexan or nylon body, metal yokes.
 4. Locking or straight-blade configurations, per plans.
 5. Leviton V-0-MAX.

2.5 SPECIALTY RECEPTACLES

- A. Combination Tamper-Resistant Duplex Receptacle & USB Charger:
1. Duplex NEMA 5-20R, 120 volt, 20 amp, 3 wire, U-ground.
 2. Commercial spec grade.
 3. Tamper Resistant (TR) construction with dual spring-loaded shutters to block single object insertion into either H or N openings.
 4. Dual 5VDC, USB charging ports, one USB-A and one USB-C ports.

5. Capable of charging two USB devices simultaneously.
6. Total of 5.0 Amps of charging capacity.
7. Decora style for mounting in single gang box.
8. Eaton Arrow-Hart TRUSBAC20* 7756* series.

2.6 CONNECTORS

A. Cord Receptacles & Connectors:

1. Spec grade, industrial duty, and impact resistant nylon construction.
2. High visibility yellow exterior.
3. Cord grip to prevent terminal strain.
4. Deep well wire terminals, captive brass screws.
5. Dead front, captive screws, NEMA configuration molded in.
6. Female: deep set, triple wipe brass contacts.
7. Males: Solid brass blades molded into body.
8. Leviton Industrial, or equal.

2.7 DEVICE PLATES & COVERS

A. Single and combination types that mate and match with corresponding wiring devices. Provide for every switch and outlet.

B. Interior Plate Finishes:

1. Finished Spaces: Stainless steel, satin-finish, type 302, 0.04" thick.
2. Unfinished Spaces: Galvanized steel.

C. Features include the following:

1. Plate-Securing Screws: Stainless steel, galvanized or colored, to match plate finish.
2. Arrow-Hart, Leviton, Pass & Seymour, or equal.

D. Weatherproof Covers:

1. Non-Metallic Damp & Wet Location Covers:
 - a. Non-metallic, polycarbonate.
 - b. Gasketed, self-closing.
 - c. Clear, hinged lift lid.
 - d. Weatherproof during operation per NEC
 - e. Eagle WeatherBox, Pass & Seymour, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Install all equipment plumb and level.
2. Install devices tight to boxes, etc. such that no movement occurs during normal connecting and disconnecting procedures or operation.
3. Install coverplates tight to surrounding surface. Coverplate shall not provide the

- only means of support for wiring devices.
4. Where multiple devices are installed at the same location and elevation, use a single, multi-gang box and single cover plate, as applicable.
 5. Do not install receptacles directly behind any sinks, or within 36" of showers or bathtubs.
 6. Where wiring devices, such as occupancy, dimmer, timer or other control switches, require a grounded conductor (neutral) connection for operation, install neutral conductor to the mounting box. Do not connect device neutral to equipment ground wire.
 7. Where standard toggle switches are installed serving lighting loads in areas described in NEC 404.2(C), provide a grounded conductor (neutral) to the switch device box location as specified. Do not connect device neutral to equipment ground wire.

B. Rough-in: Unless noted otherwise, the following mounting heights shall be used:

- | | | |
|----|--------------------------|------------------------------------|
| 1. | Wall receptacles: | 18" AFF to center. |
| 2. | Counter top receptacles: | 6" above counter to bottom of box. |
| 3. | Wall switches: | 48" AFF to center. |
| 4. | Exterior receptacles: | 24" above grade. |
| 5. | Roof receptacles: | 24" above roof surface. |
| 6. | Elevator Pits: | 36" above bottom of pit. |
| 7. | Full-size frig/freezer: | 42" AFF to center. |

C. Ceiling Mounted Outlets:

1. Install all ceiling mounted receptacles as follows:
 - a. Flush mounted back box, with stainless steel coverplate installed tight to ceiling tile, plaster, or GWB ceiling.
 - b. Support back box independently of ceiling, with rigid support from structure.
 - c. Twistlock outlets, unless noted otherwise.

D. Identification:

1. Permanently identify all general-purpose and dedicated equipment receptacles in all spaces in accordance with the project nomenclature.
 - a. At every receptacle, identify source panel and circuit number (i.e. RP1-12) via machine printed label (i.e. Brother P-Touch, or equal) applied at top of cover plate. Printing shall be black, minimum 1/4" high text. Label shall be visible with plug installed, as practicable.

3.2 REPAIR/RESTORATION

- A. Restore all finishes, equipment and surfaces to original condition, where affected by the work of this section.

3.3 RE-INSTALLATION

- A. Reinstall all outlets, coverplates and similar devices, where removed to accomplish the work of these documents.
- B. Where the devices are damaged during removal or reinstallation, replace with new

devices of similar quality, color, etc. to existing.

3.4 CLEANING

A. General:

1. Clean all construction debris from within outlet boxes, prior to close up.
2. Remove all paint, joint compound and other marks from devices and coverplates.

END OF SECTION

SPECIAL PROVISIONS

Builder's Risk Insurance

- A. The Contractor shall, at his/her own cost, insure the work and keep it insured at all times during the period of construction, and until final acceptance of it by the County against loss of damage covered by an "All Risk" Builders Risk type of policy. The amount of insurance shall be the 100% estimated replacement cost of the work.
- B. The policies shall be made payable to the County and the Contractor, as their interest may appear, and the policies shall be left in the possession of the Engineer, prior to the start of construction.

S E C T I O N I I I

Permits

N/A

SECTION I V

Proposal

**This Section to be
Completed by Time of Bid**

SECTION-IV
PROPOSAL

DESCRIPTION OF WORK

Bid Opening via Teleconference WebEx: Thursday, May 22, 2025 @ 10:30 a.m. EST.
WebEx Phone Number 1-415-655-0001, Access Code Number 2307 082 0253##.

Begin Work Within Fifteen (15) Days After NOTICE TO PROCEED

Calendar Days for Completion: One Hundred Fifty (150)

Liquidated and Other Damages: FIFTEEN HUNDRED DOLLARS (\$1500.00 PER CALENDAR DAY)

Cost Group “B” (\$100,001 to \$500,000) (Prequalified contractors with a Cost Group restriction must bid within the dollar amount stated on their Certificate of Prequalification)

Work Classification: I5

TO BALTIMORE COUNTY, MARYLAND: Provide and install replacement of split system serving offices and break room of the Sign & Signal shop area. **Glen Arm - District 11c3.**

The following listed Drawing Number(s) are collectively the “Drawings”, and are hereby incorporated in the Contract.

Workday Number

Drawing Number(s)

10000969

2025-1480 thru 1485 & 2025-0007 thru 0009

A pre-bid meeting will be held on Wednesday, May 7, 2025 at 10:00 a.m. EST via WebEx. *Phone-In (Audio Only)* – 1-415-655-0001, Meeting Number 2315 748 1904##. *Video Conference* – Meeting Number 2315 748 1904 , **Password: YmQBwHea327**, go to <https://signin.webex.com/join>, or for the WebEx link go to www.baltimorecountymd.gov/departments/public-works/engineering/contracts/current-solicitations

NOTE: No successful bidder may withdraw their bid within NINETY (90) days after the opening thereof.

The Contractor hereby declares that it has carefully examined the solicitation, plans and specifications, form of contract, Special Provisions and Drawings (collectively the “Contract Documents”). The Contractor also hereby declares that it has carefully examined the September 2023 “Standard Specifications for Construction and Materials” and “Standard Details for Construction”, collectively the “Applicable County Law” and any and all Department of Public Works and Transportation revisions thereto as of the date of advertisement. The Contract Documents, the Applicable County Law and the Department of Public Works and Transportation revisions thereto are collectively the “Specifications” and are incorporated herein. Copies of any and all Department of Public Works and Transportation revisions including but not limited to the General Conditions Building Projects, are available online at www.baltimorecountymd.gov/departments/public-works/standards. Also, the Contractor has, to its satisfaction, examined the locality of the proposed work and agrees to furnish all labor, tools, materials, machinery, equipment, and other means of construction called for in the manner provided in the Specifications for the prices shown on the next page(s) and as evidenced by Contractor’s signature on the last page thereof.

SCHEDULE OF PRICES

NOTE: The Bidder shall fill out this Proposal, write in the unit prices in clear numerals, and make the extensions.

For complete information concerning these items, see Specifications and contract forms.

CONTRACT PROPOSAL

Glen Arm Maintenance Facility Sign & Signal HVAC Replacement - 12200 Long Green Pike, Glen Arm, MD. 21057

CONTRACT NUMBER: 25053 PO0

WORKDAY NUMBER: PROJ-10000969

#REF!

CALENDAR DAYS: 150

CONTRACTOR: _____
ADDRESS: _____
PHONE: _____

BID ITEM	COMM. CODE		DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1	0	0000	GLEN ARM MAINTENANCE FACILITY SIGN & SIGNAL HVAC REPLACEMENT	LS	1		\$
TOTAL COST FOR CONTRACT							\$

TOTAL COST FOR CONTRACT IN WORDS

OFFICER SIGNATURE

TITLE

PROPOSAL AFFIDAVIT

1. AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the [title]_____ and the duly authorized representative of [business]_____ (the "Business") and that I possess the legal authority to make this Affidavit on behalf of myself and the Business for which I am acting.

2. PROPOSAL CERTIFICATION

THE UNDERSIGNED HEREBY ACKNOWLEDGES receipt of the following Addenda (list by number and date):

Accompanying this Proposal is a Bid Bond in an amount of 5% of the bid, the exact amount to be determined by the difference between the low bid and the next lowest bid, if two or more bids are received, or 5% of the bid if one bid is received. This guarantees payment to Baltimore County of the amount thus determined as liquidated damages in case of default in any matter specified as required before award or in any matter resulting in failure to execute and deliver an Agreement, together with Payment and Performance Bonds, after award.

3. AFFIRMATION REGARDING BRIBERY CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies (as is defined in Section 16-101(f) of the State Finance and Procurement Article of the Annotated Code of Maryland), has been convicted of, or has had probation before judgment imposed pursuant to Section 6-225 of the Criminal Procedure Article of the Annotated Code of Maryland, or has pleaded nolo contendere to a charge of, bribery, attempted bribery, or conspiracy to bribe in violation of Maryland law, or of the law of any other state or federal law, except as follows [indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and their current positions and responsibilities with the Business]:

4. AFFIRMATION REGARDING OTHER CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies, has:

(1) Been convicted under state or federal statute of a criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract, fraud, embezzlement, theft, forgery, falsification or destruction of records, or receiving stolen property;

(2) Been convicted of any criminal violation of a state or federal antitrust statute;

(3) Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. §1961, et seq., or the Mail Fraud Act, 18 U.S.C. §1341, et seq., for acts arising out of the submission of bids or proposals for a public or private contract;

(4) Been convicted of a violation of the State Minority Business Enterprise Law, Section 14-308 of the State Finance and Procurement Article of the Annotated Code of Maryland;

(5) Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsection (1), (2), (3), or (4) above;

(6) Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract;

(7) Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts or omissions that would constitute grounds for conviction or liability under any law or statute described above, except as follows [indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the Business, and the status of any debarment]:

5. AFFIRMATION REGARDING DEBARMENT

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows [list each debarment or suspension providing the dates of the suspension or debarment, the name of the public entity and the status of the proceeding, the name(s) of the person(s) involved and their current positions and responsibilities with the Business, the grounds of the debarment or suspension, and the details of each person's involvement in any activity that formed the grounds of the debarment or suspension]:

6. AFFIRMATION REGARDING DEBARMENT OF RELATED ENTITIES

I FURTHER AFFIRM THAT:

(1) The Business was not established and it does not operate in a manner designed to evade the application of or defeat the purpose of debarment pursuant to Sections 16-101, et seq., of the State Finance and Procurement Article of the Annotated Code of Maryland; and

(2) The Business is not a successor, assignee, subsidiary, or affiliate of a suspended or debarred business, except as follows: [you must indicate the reasons why the affirmations cannot be given without qualification]:

7. SUB-CONTRACT AFFIRMATION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, has knowingly entered into a contract with a public body under which a person debarred or suspended under Title 16 of the State Finance and Procurement Article of the Annotated Code of Maryland will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

8. AFFIRMATION REGARDING COLLUSION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, members or partners, nor any of its employees, have in any way:

(1) Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the accompanying bid or offer that is being submitted;

(2) In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the bidder or offeror or of any competitor, or otherwise take any action in restraint of free competitive bidding in connection with the contract for which the accompanying bid or offer is submitted;

(3) Colluded with anyone to obtain information concerning the bid that would give the Business an unfair advantage over others.

9. POLITICAL CONTRIBUTION DISCLOSURE AFFIRMATION

I FURTHER AFFIRM THAT:

The Business affirms that it is aware of, and will comply with, the provisions of Sections 14- 101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, which require that every person who makes, during any 12-month period, one or more contracts, with one or more Maryland governmental entities involving cumulative consideration, or at least \$200,000.00, shall file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of \$500 during defined reporting periods.

10. CERTIFICATION OF CORPORATION REGISTRATION AND TAX PAYMENT

I FURTHER AFFIRM THAT:

(1) The Business is a _____(State) (Corporation), (LLC), (Partnership), (Sole Proprietor/Individual), (Other:_____), that it **is** registered in accordance with the Corporations and Associations Article of the Annotated Code of Maryland, that it **is** in good standing in the State of Maryland, and that it **has** filed all of its annual reports, together with filing fees, with the Maryland State Department of Assessments and Taxation, and that the name and address of its resident agent filed with the State Department of Assessments and Taxation is:

Name: _____

Address: _____

(If none, so state)

(2) Except as validly contested, the Business has paid, or has arranged for payment of, all taxes due the State of Maryland and Baltimore County, and has filed all required returns and reports with the Comptroller of the Treasury, the State Department of Assessments and Taxation, and the Employment Security Administration, as applicable, and will have paid all withholding taxes due the State of Maryland prior to final settlement.

11. CONTINGENT FEES

I FURTHER AFFIRM THAT:

The Business has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the Business, to solicit or secure the Contract, and that the Business has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or other consideration contingent on the making of the Contract.

12. NONDISCRIMINATION IN EMPLOYMENT STATEMENT

I FURTHER AFFIRM THAT:

During the performance of any contract awarded of which this affidavit is a part:

(1) The Business will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test. The Business will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test. Such action shall include, but not be limited to the following: employment, promotion, upgrading, demotion or transfer, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Business agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the owner setting forth provisions of this nondiscrimination clause.

(2) The Business will, in all solicitations or advertisements for employees placed by or on behalf of the Business, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test.

(3) The Business shall send to each labor union or representative of workers with which the Business has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the owner, advising the said labor union or workers' representative of these commitments, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Business shall furnish, if requested by the County, a compliance report concerning our employment practices and policies in order for the County to ascertain compliance with the special provisions of this affidavit concerning nondiscrimination in employment.

(5) In the event of the Business's noncompliance with the nondiscrimination clause of this affidavit, the contract may be canceled, terminated, or suspended in whole or in part, and the Business may be declared ineligible for further County work.

(6) The Business shall include the special provisions outlined herein pertaining to nondiscrimination in employment in every subcontract, so that such nondiscrimination in employment provisions shall be binding on each subcontractor or vendor.

13. FOREIGN CONTRACTS

I FURTHER AFFIRM THAT:

The Business affirms that it is aware of, and will comply with, the provisions of Sections 10-2-110 Article 10. Finance, Title 2 – Purchasing, Baltimore County Code 2003, which requires that prior to the award of a contract for services under the provisions of this title, and during the entire term of a contract award, the bidder or vendor shall disclose to the County whether any services covered by the bid or contract, including any subcontracted services, will be performed outside the United States. The disclosure shall be made to the Office of Budget and Finance, Purchasing Bureau.

14. MINORITY BUSINESS ENTERPRISE AND FEMALE CONTRACTORS

THIS BUSINESS INTENDS to affirmatively seek out and consider minority business enterprises to participate in this contract as subcontractors and/or suppliers of materials and services.

THE UNDERSIGNED UNDERSTANDS AND AGREES: that any and all subcontracting of supplies and services in connection with this contract, whether undertaken before or after award of contract, will be in accordance with the Minority Business Enterprise and Female Contractor requirement included in the Bid Proposal package and incorporated herein as if fully set forth; and

THE UNDERSIGNED ALSO UNDERSTANDS AND AGREES that no subcontracting will be approved until Baltimore County has reviewed and approved the affirmative actions taken by this firm.

15. REQUIREMENTS FOR EXECUTING AFFIDAVIT & PROPOSAL

The Affidavit must be signed in ink in order for the bid to be accepted and that the Proposal must be typewritten or filled out in ink.

THE UNDERSIGNED ALSO UNDERSTANDS that:

Proposals submitted by an INDIVIDUAL must be signed by an individual.

Proposals submitted by a PARTNERSHIP must be signed by the partner who is legally authorized authority to bind the partnership. Attach a copy of the Partnership Agreement and a duly certified resolution evidencing the authority of the partner so signing on behalf of the partnership.

Proposals submitted by a CORPORATION must be signed by a legally authorized officer of the corporation and attested to by the Corporate Secretary. Attach a copy of the Articles of Incorporation, By-Laws and a duly certified Board Resolution evidencing the authority of the officer so signing on behalf of the corporation.

Proposals submitted by a LIMITED LIABILITY COMPANY must be signed by a legally authorized member of the company and attested to. Attach a copy of the Operating Agreement, Articles of Organization and a duly certified resolution evidencing the authority of the member so signing on behalf of the limited liability company.

NOTE: The contractor may file with the County a list of the names of those officers, partners or members, as applicable, having legal authority to execute documents on behalf of and legally bind the contractor, duly certified, as applicable and legally required, together with the aforesaid corporate documents, which shall remain in full force and effect until such time as the County Department of Public Works and Transportation, Construction Contract Administration is advised in writing to the contrary.

16. ACKNOWLEDGMENT

I ACKNOWLEDGE THAT this Affidavit is to be furnished to the County and may be distributed to units of (1) Baltimore County; (2) the State of Maryland; (3) other counties or political subdivisions of the State of Maryland; (4) other states; and (5) the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Maryland, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this bid or proposal shall be construed to supersede, amend, modify or waive, on behalf of Baltimore County, or the State of Maryland or any unit of the State of Maryland having jurisdiction, the exercise of any statutory right or remedy conferred by the Constitution and the laws of Maryland with respect to any misrepresentation made or any violation of the obligations, terms and covenants undertaken by the Business with respect to (a) this Affidavit, (b) the contract, and (3) other Affidavits comprising part of the contract.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

WITNESS/ATTEST:

_____	By: _____
Date: _____	Name: _____
	Title: _____
	(Authorized Representative and Affiant)

BID BOND

Principal

Business Address of Principal

Surety

Obligee: **BALTIMORE COUNTY, MARYLAND**
A body corporate and politic

A Corporation of the State of _____ and authorized to do business in Maryland

Five Percent of Bid Amount \$ _____ 5% of Bid

Penal Sum of Bond [shall be determined pursuant to latest revised Specification / G.P. 2.07 (2000 Ed.)]

Glen Arm Maintenance Facility Sign & Signal HVAC Replacement
Contract Name

25053 PO0
Contract Number/Proposal Item Number

KNOW ALL MEN BY THESE PRESENTS, that we, the Principal, above named, and Surety, above named, and authorized to do business in the State of Maryland, are held and firmly bound unto the Obligee, above named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that if the aforesaid Principal is the apparent low bidder and complies with all specified matters required before award or if the aforesaid Principal is awarded the contract, the said Principal will, within the time required, execute and deliver to the Obligee a formal contract and good and sufficient payment and performance bonds in the form provided by the Obligee, then, this obligation to be void; otherwise the Principal and Surety will, upon demand, pay unto the Obligee the entire Penal Sum of this Bid Bond as liquidated damages.

THE SURETY FURTHER GUARANTEES No Proposal will be considered unless accompanied by a guaranty of the amount specified in the Proposal in the form of either a certified check, bank cashier's check or a Bid Bond on the form provided therein or an exact facsimile thereof. The Bid Bond must be executed by a Surety that is, as of the date of the Bid: (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. The Bid Bond must guaranty payment to the County of liquidated damages as follows: (a) if only one Bid is received, the guaranteed payment shall be five (5%) percent of the Bidder's Bid amount, (b) if two or more Bids are received, the guaranteed payment shall be the difference between the Bidder's Bid amount and the next lowest Bid amount, subject to the limitation that the guaranteed payment not be greater than five (5%) percent of the Bidder's Bid amount. This Bid Bond is required in case the successful Bidder, after issuance of notice of Award, fails to comply, timely and completely, with each of the requirements set forth under Section GP-3.04.

Signed and sealed _____
Date

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of:

Individual Principal

Witness: _____

as to: _____ (SEAL)

Print Name: _____

Print Name: _____

Corporate Principal

In Presence of:

(Name of Corporation)

Witness: _____

By: _____

Print Name: _____

Print Name: _____ (SEAL)

Title: _____

Surety

(Name of Surety)

Business Address: _____

Witness: _____

By: _____ Affix

Print Name: _____

Print Name: _____ Corporate

Title: _____ Seal

**BALTIMORE COUNTY
PREVAILING WAGE AND LOCAL HIRING**

AFFIDAVIT

(Project Name) _____

Proposal No.: _____

Project No.: _____

On behalf of _____, I do solemnly declare and affirm,
(Contractor)
under penalty of perjury, that to the best of my knowledge, information, and belief:

1. I have submitted all documentation in accordance with Baltimore County Code § 10-2- 506 and § 10-2-507 regarding the prevailing wage and local hiring laws and requirements of the prevailing wage guidelines located at ([Prevailing Wage and Local Hire Laws](#)), and acknowledge that I have read and agree to all provisions of said law, as amended, and have a continuing obligation to be compliant with the law and any changes to the law.

2. I shall not knowingly provide any false information relating to payroll documentation and/or hiring of local employees for capital improvement contracts that are subject to the prevailing wage and/or local hiring laws of Baltimore County. I further attest and certify that all documentation relating to the same will be accurate and complete and will remain accurate and complete on an ongoing basis, and will reflect the payroll and/or local hiring status of contractors, subcontractors, apprentices, and independent contractors performing work for the Contract (contract number _____). I acknowledge that I have been informed and am aware of the foregoing requirements and that I am authorized to make this certification on behalf of myself and all subcontractors and parties performing work pursuant to this Contract.

3. I certify and attest that I am an officer or agent of the Contractor or subcontractor who supervises the payment of employees. I understand and agree that all documentation related to prevailing wages and/or local hiring required by law shall be submitted to Baltimore County's Prevailing Wage Administrator or designee before any surety is released or final payment due under the terms of the Contract is made.

4. I further certify and attest that I will have personal knowledge of the wages paid to all employees of _____ for work performed on the Contract and of all of the hours worked, and that I am an authorized agent of the Contractor and assume responsibility for my actions.

5. I further certify and attest that _____ will comply with prevailing wage rates set by the State of Maryland as the same apply to the Contract and are a part of the bid documents and Contract, and that _____ will comply with applicable local hiring requirements.

6. I attest and certify that, if the Contract is subject to the local hiring requirement under §10-2-507 of the Baltimore County Code, _____ will make best efforts to ensure that residents of Baltimore County constitute at least 51% of the new hires made for the Contract, subject to all exceptions allowable by law.

7. I certify and attest that, if the Contract is subject to prevailing wage requirements, no rebates or deductions will be made, directly or indirectly, from any wages paid in connection with the Contract, other than those provided for by law.

8. I certify and attest that, if awarded the Contract and if the Contract is subject to prevailing wage law, I will submit certified payroll to the County through its electronic compliance system or as instructed by the Prevailing Wage and Local Hire Unit.

9. I certify that if awarded the Contract, I will provide a list of subcontractors who will participate as a beneficiary of this project to the agency and the Prevailing Wage and Local Hire Unit at PrevailingWage@baltimorecountymd.gov.

10. I understand that no funds will be dispersed by the County until an Employment Analysis has been issued to the Prevailing Wage and Local Hire Unit in compliance with the local hire law. The Employment Analysis will include how many jobs will be required to complete the project; how many current employees are available to complete the project, and how many of those jobs will require new hires.

Contractor/Bidder/Offeror

By

Printed Name

Printed Title

Date

Phone

License Number

Business Email

BALTIMORE COUNTY, MARYLAND

Prevailing Wage and Local Hiring Contract Requirements and Policies

The Contractor and all Subcontractors must comply with the Prevailing Wage and Local Hiring Laws, contained in Baltimore County Code § 10-2-506 and § 10-2-507, respectively, as amended. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. The County will use the prevailing wage established by the State of Maryland (the "State") Department of Labor for state funded construction contracts in the County at the time of award. These rates include the basic hourly rate and fringe benefits. Apprentices must be paid at least the rate that the State's Apprenticeship and Training Council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade. Any Contractor that is subject to the prevailing wage or local hiring law will be required to agree to the below provisions:

For the purposes of these requirements, an employee means an apprentice, laborer or mechanic employed by a contractor or subcontractor on a capital improvement project with a value of over \$300,000 or a County-subsidized capital project with a value over \$5,000,000.

Capital Improvement Project does not include blanket order or open-end agreements, capital improvement projects subject to a federal or state prevailing wage law, awarded without competition; with another governmental entity; to the extent the contractor is precluded from compliance by the terms of any federal or state law, contract or grant; entered into pursuant to Baltimore County Code § 10-2-310(e); entered into as a joint or cooperative purchase; or entered into as an emergency purchase.

The purpose of a prevailing wage is to ensure that contractors institute local hiring practices for Capital Improvement contracts and Capital Projects under certain circumstances as required by law, and that the Contractor's employees who work on capital improvement contracts are paid the going rate for their services. The prevailing wage rates are established by the State of Maryland Department of Labor and apply to all of the Contractor's employees and any and all Subcontractors. The Contractor and all Subcontractors must comply with all of the requirements of the Prevailing Wage Law including, but not limited to, the following:

1. Pay employees the prescribed rate as annually established by the State's Department of Labor; the prevailing wage rates in effect on the date a solicitation is issued and will apply throughout the term of a contract resulting from that solicitation. Contractor or subcontractors may NOT split or subdivide a capital improvement contract, pay an employee through a third party, treat an employee as a subcontractor or independent contractor to avoid any requirement of the County's prevailing wage law; or employ an individual classified as a helper or trainee to perform direct and measurable work on a capital improvement contract.

2. Pay employees at a rate equal to or more than the prevailing wage rate currently in effect for the type of work performed.

3. Pay employees overtime for work (I) more than eight hours in any single calendar day; (II) more than 40 hours in a work week; or (III) on a Sunday or a legal holiday.

4. Classify employees in their proper work classification in conformance with the schedule established by the State's Department of Labor.

5. May only make fair and reasonable deductions that are (a) required by law; (b) authorized in a written agreement between an employee and contractor or subcontractor signed at the beginning of employment (any deductions taken from employee paychecks including healthcare, pension, 401K, IRA, etc., child/spouse support, or tax levies); and submitted by the contractor or subcontractor to the Director of the County's Prevailing Wage Program; or required or allowed by a collective bargaining agreement between a bona fide labor organization and a contractor or subcontractor.

Electronically submit a certified copy of payroll records through the County's designated certified payroll and compliance system within 14 days after the end of payroll week ending date, to verify that Prevailing Wage rates have been paid to employees.

6. Backup documentation may be required upon demand from the County to be submitted for all 3rd party benefits being claimed, to include, but not limited to: *one month's healthcare transmittal showing employee name and amount company pays on their behalf, company vacation/sick policy, etc. or if Union, a Union transmittal for one month in which work has been performed.*

7. Retain records for a period of five (5) years after the work is completed and permit the Director of the County Prevailing Wage Program, or his/her designee, to inspect the payroll records at a reasonable time and as often as necessary.

8. Payroll records shall contain a statement signed by the contractor or subcontractor (including tiered subcontractors) certifying that the payroll records are complete and correct; the wage rates are not less than required by the Prevailing Wage Law; and the rate of pay and classification for each employee accurately reflects the work the employee performed.

9. All payroll records shall include the name, address, telephone number and email address of the contractor or subcontractor; the name and location of the job; and each employee's name, current address, unless previously reported; specific work classification; daily basic time and overtime hours; total basic time and overtime hours for the payroll period; rate of pay; fringe benefits by type and amount; and gross wages, and any deductions taken from employees' paychecks including, but not limited to, healthcare, pension/401K/IRA. Late submission of copies of any payroll records may be deemed deficient by the County until the required records are provided, and the County may postpone processing payments due under the Contract or under an agreement to finance the Contract.

10. Submit to random or regular audits and investigation of any complaint of a violation of the County's Prevailing Wage and Local Hiring Laws and requirements.
11. Make best efforts to fill at least 51% of new jobs required to complete the capital improvement contract or capital project with Baltimore County residents.
12. Submit monthly reports to the Director of the County's Prevailing Wage Unit relating to local hiring with respect to capital improvement contracts over \$300,00 or County-subsidized capital construction projects receiving assistance over \$5,000,000, that includes (a) the number of new hires needed for the contract or project, (b) the number of County residents hired during the reporting period, (c) the total number of all employees hired during the contract period, (d) best efforts made to fill open positions with County residents, and (e) 5) for new hires: name, last four (4) digits of the social security number, job title, hire date, address and referral source.
13. Agree that any and all disputes will be handled as set forth in the County's Prevailing Wage and Local Hire as a condition of award.
14. In the event the County determines that a provision of the Prevailing Wage and/or Local Hire Law has been violated, the County shall issue a written decision, including appropriate sanctions, and may withhold payment due the Contractor in an amount sufficient to pay each employee of the Contractor or any subcontractors the full amount of wages due under the Prevailing Wage Law, and an amount sufficient to satisfy a liability of the Contractor for liquidated damages as provided under the Prevailing Wage Law, pending a final decision on the violation by the County. The Contractor may appeal a written decision of the Director of the County's Prevailing Wage Unit that the Contractor violated a provision of the Prevailing Wage and/or Local Hire Law, to the Office of Administrative Hearings ("OAH"), within ten (10) working days after receiving a copy of the decision. OAH will conduct a hearing upon the receipt of a timely appeal. If no appeal, the decision of the Director of the County's Prevailing Wage Unit or his/her designee becomes final. A Contractor who is found to have violated the provisions of the Prevailing Wage or Local Hiring Laws intentionally, may not be awarded a County contract or work on any County project for a period of one year from the date of the OAH determination.
15. May not discharge, or otherwise retaliate against, an employee for asserting any right under the Prevailing Wage Law or for filing a complaint of a violation;
16. An aggrieved employee is a third-party beneficiary of the Contract and may by civil action recover the difference between the prevailing wage for the type of work performed and the amount actually received, with interest and a reasonable attorney's fee.
17. Each Contract subject to the Prevailing Wage and Local Hire Laws may specify the payment of liquidated damages to the County by the Contractor for any noncompliance with the Prevailing Wage and Local Law. Liquidated damages are:
 - a. \$10 for each calendar day that the payroll records are late (payrolls are to be submitted no later than 14 days after the week ending date shown on Certified Payroll Record CPR);
 - \$20 for each day that an employee is misclassified and/or paid less than the prevailing

wage rate; and a civil penalty of \$50 per violation of the requirement to post the prevailing wage rates at the work site.

- b. \$50 per month for each month the Local Hire report is not submitted by the last day of the existing month due.

These liquidated damages are solely related to prevailing wage and local hiring compliance and do not negate any other remedies available or set forth in the Contract, including delay damages or actual damages. These remedies are separate from, in addition to, and not in lieu of, any remedies available and set forth in the Contract, or at law, for other breaches or defaults under the Contract.

- 18. Where the initial Contract Sum is \$300,000 or below, but it is subsequently increased and exceeds \$300,000 due to an approved Contract Modification, the amount of any such Contract Modification that causes the Contract Sum to exceed \$300,000 is subject to the Prevailing Wage and Local Hiring Laws.
- 19. The Contractor and all subcontractors must post a clearly legible statement of each prevailing wage rate in a prominent and easily accessible place at the Work Site during the entire time Work is being performed, in English and any other language that is primarily spoken by the employees, at the Work Site.
- 20. A contract may include the actual cost of health and dental insurance, pension or retirement plan, paid time off such as vacation or sick days and life insurance. In calculating the cost per hour, divide the annual cost of benefits by 2,080 hours for each employee. Other benefits such as the use of a company vehicle, cell phones, lodging reimbursement, company owned tools **may not be credited towards the fringe benefit amount.**
- 21. All apprentices must be registered with the Maryland Apprenticeship and Training Council, V.A., or US DOL as well as be currently enrolled in, and attending appropriate classes, to which is considered “actively enrolled”. Only actively enrolled apprentices may be employed on the project at the apprentice prevailing wage rate.

Classification	Modification Reason	Basic Hourly Rate	Borrowed From	Fringe Benefit Payment
BALANCING TECHNICIAN	AD	\$47.92		\$24.44
BRICKLAYER	AD	\$37.50		\$14.78
CARPENTER	AD	\$34.41		\$14.49
CARPENTER - SHORING SCAFFOLD BUILDER	AD	\$34.41		\$14.49
CARPET LAYER	AD	\$34.12		\$14.86
CEMENT MASON	AD	\$25.00	510	\$1.94
COMMUNICATION INSTALLER TECHNICIAN	AD	\$36.37		\$12.89
DRYWALL - SPACKLING, TAPING, & FINISHING	AD	\$34.41		\$14.49
ELECTRICIAN	AD	\$47.13		\$21.94
ELEVATOR MECHANIC	AD	\$56.36		\$45.50
FIRESTOPPER	AD	\$29.81		\$10.08
GLAZIER	AD	\$35.60		\$14.41
INSULATION WORKER	AD	\$40.02		\$19.92
IRONWORKER - FENCE ERECTOR	AD	\$40.02		\$19.92
IRONWORKER - ORNAMENTAL	AD	\$31.17	510	\$24.38
IRONWORKER - REINFORCING	AD	\$29.20	510	\$23.57
IRONWORKER - STRUCTURAL	AD	\$33.12		\$25.63
LABORER - AIR TOOL OPERATOR	AD	\$24.46		\$9.69
LABORER - ASPHALT PAVER	AD	\$24.46		\$9.69
LABORER - ASPHALT RAKER	AD	\$22.63		\$4.88
LABORER - BLASTER - DYNAMITE	AD	\$24.46		\$9.69
LABORER - BURNER	AD	\$24.46		\$9.69
LABORER - COMMON	AD	\$22.63		\$4.88
LABORER - CONCRETE PUDDLER	AD	\$22.63		\$4.88
LABORER - CONCRETE SURFACER	AD	\$24.46		\$9.69
LABORER - CONCRETE TENDER	AD	\$22.63		\$4.88
LABORER - CONCRETE VIBRATOR	AD	\$22.63		\$4.88
LABORER - DENSITY GAUGE	AD	\$22.63		\$4.88
LABORER - FIREPROOFER - MIXER	AD	\$22.63		\$4.88
LABORER - FLAGGER	AD	\$22.63		\$4.88
LABORER - GRADE CHECKER	AD	\$22.63		\$4.88
LABORER - HAND ROLLER	AD	\$22.63		\$4.88
LABORER - HAZARDOUS MATERIAL HANDLER	AD	\$24.46		\$9.69
LABORER - JACKHAMMER	AD	\$22.63		\$4.88
LABORER - LANDSCAPING	AD	\$22.63		\$4.88
LABORER - LAYOUT	AD	\$22.63		\$4.88
LABORER - LUTEMAN	AD	\$22.63		\$4.88
LABORER - MASON TENDER	AD	\$24.46		\$9.69
LABORER - MORTAR MIXER	AD	\$22.63		\$4.88
LABORER - PIPELAYER	AD	\$24.46		\$9.69
LABORER - PLASTERER - HANDLER	AD	\$22.63		\$4.88
LABORER - SCAFFOLD BUILDER	AD	\$24.46		\$9.69
LABORER - TAMPER	AD	\$22.63		\$4.88
MECHANICAL SYSTEMS SERVICE TECH - ELECTRICAL SYSTEMS	AD	\$46.21	510	\$24.90

MECHANICAL SYSTEMS SERVICE TECH-HVAC SYSTEMS	AD	\$46.21		\$24.90
MECHANICAL SYSTEMS SERVICE TECH-PLUMBING SYSTEMS	AD	\$46.21		\$24.90
MECHANICAL SYSTEMS SERVICE TECH - REFRIGERATION SYSTEMS	AD	\$52.27	003	\$24.58
MILLWRIGHT	AD	\$38.61		\$17.21
PAINTER	AD	\$28.55		\$11.87
PAINTER-INDUSTRIAL	AD	\$35.55		\$15.28
PILEDRIIVER	AD	\$36.60		\$16.78
PLUMBER	AD	\$46.21		\$24.90
POWER EQUIPMENT OPERATOR - BACKHOE	AD	\$33.00	510	\$13.55
POWER EQUIPMENT OPERATOR - BROOM / SWEEPER	AD	\$32.23	510	\$14.62
POWER EQUIPMENT OPERATOR - BULLDOZER	AD	\$34.18		\$14.62
POWER EQUIPMENT OPERATOR - CONCRETE PUMP	AD	\$44.35		\$0.00
POWER EQUIPMENT OPERATOR - CRANE	AD	\$41.00		\$18.10
POWER EQUIPMENT OPERATOR - CRANE - TOWER	AD	\$41.00		\$18.10
POWER EQUIPMENT OPERATOR - DRILL - RIG	AD	\$33.16		\$14.15
POWER EQUIPMENT OPERATOR - EXCAVATOR	AD	\$34.18		\$14.62
POWER EQUIPMENT OPERATOR - FORKLIFT	AD	\$34.18		\$14.62
POWER EQUIPMENT OPERATOR - GRADALL	AD	\$34.00	510	\$13.55
POWER EQUIPMENT OPERATOR - GRADER	AD	\$34.18		\$14.62
POWER EQUIPMENT OPERATOR - GUARD RAIL POST DRIVER	AD	\$23.50		\$5.07
POWER EQUIPMENT OPERATOR - LOADER	AD	\$34.18		\$14.62
POWER EQUIPMENT OPERATOR - MECHANIC	AD	\$36.24		\$14.62
POWER EQUIPMENT OPERATOR - MILLING MACHINE	AD	\$30.58	510	\$13.55
POWER EQUIPMENT OPERATOR - PAVER	AD	\$32.10	510	\$13.55
POWER EQUIPMENT OPERATOR - ROLLER - ASPHALT	AD	\$32.10	510	\$13.55
POWER EQUIPMENT OPERATOR - ROLLER - EARTH	AD	\$28.60		\$14.62
POWER EQUIPMENT OPERATOR - SCREED	AD	\$30.00	510	\$11.80
POWER EQUIPMENT OPERATOR - SKID STEER (BOBCAT)	AD	\$32.23		\$14.62
POWER EQUIPMENT OPERATOR-VACUUM TRUCK	AD	\$37.50		\$14.85
RESILIENT FLOOR	AD	\$34.12		\$14.86
SHEETMETAL WORKER (INCLUDING METAL ROOFING)	AD	\$47.92		\$24.44
SPRINKLERFITTER	AD	\$42.32	510	\$26.05
SPRINKLERFITTER/PIPEFITTER	AD	\$46.21		\$24.90
STONE MASON	AD	\$44.30	510	\$21.22
TILE & TERRAZZO FINISHER	AD	\$28.09		\$12.59
TILE & TERRAZZO MECHANIC	AD	\$33.41		\$14.24
TRUCK DRIVER - DUMP	AD	\$17.64	510	\$1.92
TRUCK DRIVER - FLATBED	AD	\$20.94		\$7.63
TRUCK DRIVER - LOWBOY	AD	\$29.68	510	\$10.51
TRUCK DRIVER - TACK/TAR TRUCK	AD	\$27.35	510	\$8.97

BALTIMORE COUNTY, MARYLAND
USE OF MINORITY BUSINESS ENTERPRISES AND WOMEN'S BUSINESS ENTERPRISES
IN
COUNTY CONTRACTS
MWBE Plan Package



Division of Diversity, Equity and Inclusion
The Jefferson Building
105 West Chesapeake Avenue
Towson, Maryland 21204
410-887-3407

www.baltimorecountymd.gov/go/mwbe



PROSPECTIVE BIDDERS/OFFERORS

Baltimore County Executive Order 2022-005 Use of Minority Business Enterprises and Women's Business Enterprises states:

SECTION 6. BID REQUIREMENTS.

- (A)(1) All bidders shall submit a list of all subcontractors contacted in preparation of their bid package or proposal.*
- (2) The list shall include the service to be performed, bid amount, and the race/ethnicity/gender of the business owner(s).*
- (B)(1) All bidders shall submit a list of all subcontractors to be used on a county contract in the bid package.*
- (2) This list shall include all subcontractors (both MWBE and non-MWBE) used, the service to be performed, the total amount to be paid, and the race/ethnicity/gender of the owner.*

If the solicitation includes a MWBE **subcontracting** goal, you **MUST** demonstrate “**Good Faith**” **effort** either by:

1. Complete and sign FORM A, FORM B (to include FORM B-Prime if MWBE Prime wishes to count towards the goal) and FORM C **listing all subcontractors** with the initial bid submission.
 - a. *All Forms must be completed and signed. However, FORM C **MUST** be completed and signed by both the prime and the MWBE subcontractor.*
- OR**
2. If you are unable to meet any portion of the goal, you **MUST** do one of the following:
 - a. If you are requesting a **partial waiver**, complete and sign FORM A with initial bid submission. FORM B (to include FORM B-Prime if MWBE Prime wishes to count towards the goal) and FORM C (**listing all subcontractors**). In addition, complete, sign and submit FORM D and FORM E **accompanied with all supporting documentation** for the portion of the goal that will not be achieved as specified on FORM A.
 - b. If you are requesting a **full waiver**, complete and sign FORM A indicating your intent to request a full waiver **accompanied with a completed and signed FORM C listing all subcontractors**, FORM D and FORM E **accompanied with all supporting documentation. This MUST be submitted with the initial bid as specified on FORM A.**
 - c. *All Forms must be completed and signed. FORM C and FORM D **MUST** be completed and properly signed by both the Prime AND the MWBE subcontractor(s).*

NOTE: The MWBE **subcontracting** goal applies to ALL prime/general contractors including certified and non-certified minority and women owned firms. **However, a Minority-owned or a Women-owned prime may self-perform up to 50% of MWBE subcontracting goal set in the solicitation. The MWBE primes that wish to count towards the goal must list themselves on all appropriate forms.**

12/2023

BALTIMORE COUNTY, MARYLAND **MWBE PARTICIPATION SUMMARY**

Executive Order: Minority Business Enterprises and Women Business Enterprises (MWBE) shall have the maximum opportunity to participate in the performance of contracts financed in whole, or in certain circumstances, in part with County funds. Accordingly, on December 6, 2022, the County Executive adopted the EXECUTIVE ORDER No. 2022-005 addressing MWBE participation in County contracts. The December 6, 2022 Executive Order may be found on the Baltimore County website at www.baltimorecountymd.gov/go/mwbe.

Each Contract: The County shall establish a minimum MWBE participation amount for each contract, as applicable.

Bidder/Officer Responsibility: The bidder/officer shall ensure that MWBE participation occurs in accordance with the contract requirements and the County Executive's Executive Order. All bidder/officers shall ensure that MWBE have the maximum opportunity to compete for and perform County contracts, as applicable. Baltimore County, Maryland, and/or its bidder/officers and contractors shall not discriminate on the basis of race, color, national origin, disability or sex in the award and performance of any County contract.

Mobilization Payments: For subcontractors, project start-up costs can also be significant. A subcontractor that has limited resources and access to credit may find that start-up expenses inhibit its ability to bid County contracts. Under circumstances where mobilization payments are approved for the prime contractor, the subcontractor should be paid an amount equal to their participation percentage no later than five (5) business days before they are required to mobilize to perform the contracted work.

Mobilization costs represent pre-contract costs incurred by a contractor to prepare a job site before the actual commencement of the contract. These costs can include movement of personnel and equipment to the project site and for the establishment of the Contractor's offices, buildings, and other facilities necessary to begin work.

APPROVED MWBE LISTINGS

Published compilations of approved and certified MWBE, contractors, subcontractors, material suppliers, etc. include:

DIRECTORY OF MINORITY BUSINESS ENTERPRISE (MDOT):

<https://marylandmdbe.mdbecert.com>

MINORITY BUSINESS DIRECTORY OF THE CITY OF BALTIMORE:

<https://baltimorecity.diversitycompliance.com>

BIDDER/OFFEROR'S ACTIONS

Seeking Firms:

The bidder/officer will seek commitments by subcontract or otherwise from MWBE firms for supplies and/or services, any combined value of which equals or exceeds the required percentage of MWBE participation goal for the County contract. However a MWBE Prime that affirms its MWBE status on the Minority and/or Women Prime Participation Affidavit may count up to 50% of the goal.

Expenditures for Materials and Supplies:

A bidder/officer may count toward its MWBE contract requirements all expenditures for materials and supplies obtained from MWBE suppliers and manufacturers, provided that the MWBE firm is furnishing and installing the materials and is certified to perform these services. If the MWBE firm is only being used as a supplier, wholesaler and/or regular dealer or is not certified to install the supplies/materials, for purposes of achieving the MWBE participation goal, you may only count sixty percent (60%) of the value of the subcontract for these supplies/products (60% Rule). To apply the 60% Rule, first divide the amount of the subcontract for these supplies/products only (not installation) by the total Contract value. Then, multiply the result by sixty percent (60%) and insert the percentage in the Percent of Total Contract field of Form B Subcontractor Participation Schedule.

BALTIMORE COUNTY, MARYLAND **MWBE PARTICIPATION SUMMARY**

Information to be supplied: All bidder/offers shall submit the following information to the County at the time of bid submission:

1. The name of an employee designated as the bidder/offers's liaison to the County's Minority Business Enterprise Office.
2. The following forms shall be completed and submitted:
 - Certified MWBE Utilization and Fair Solicitation Affidavit (**Form A**); from among those names appearing in the Approved MWBE Listings (excepting Federal Highway Administration projects, which exclusively require DBE approved and certified by the Maryland Department of Transportation MBE Advisory Committee);
 - A Subcontractor Participation Schedule (**Form B**) completed by the prime contractor for each MWBE listed on the Form.
 - A MWBE Prime Participation Schedule (Form B-Prime) completed by a MWBE prime contractor if the firm wishes to self-perform up to 50% of the MBE/WBE goal.
 - A MWBE Disclosure and Participation Statement (**Form C**) completed and signed by the prime contractor and MWBE firm for each MWBE listed on the Form. Form C **must match** what is stated on Form B.
 - If applicable, MWBE Subcontractor Unavailable Certificate (**Form D**) completed and signed by the prime contractor and MWBE for each MWBE listed on the Form.
3. If applicable, MWBE Outreach Efforts - Compliance Statement (**Form E**) completed and signed by the Bidder/Offers. The prime shall submit a list of all subcontractors.
4. For DPW contracts, if the bidder/offers intends to fulfill the MWBE requirements by use of a joint venture, he/she must submit a Joint Venture Disclosure Affidavit (**Form D-EEO-006-A** and **B**) showing the extent of MWBE participation. If a bidder/offers intends to use a MWBE joint venture as a subcontractor to meet its MWBE requirements, the affidavit must be submitted through the bidder/offers by the proposed subcontractors and signed by all parties.
5. If the bidder/offers's proposed MWBE participation does not meet the MWBE contract requirements, information sufficient to demonstrate that the bidder/offers has made every effort to meet the requirements must be submitted. (See DETERMINATION OF BID RESPONSIVENESS hereafter)

RECORDS AND REPORTS

Returning Records: The bidder/offers must keep such records as are necessary to determine compliance with its MWBE utilization requirements:

1. The MWBE and non-minority contractors, type of work being performed, actual values of work and services.
2. Documentation of all correspondence, contacts, telephone calls, etc., to obtain MWBE services for the contract.
3. All prime contractors and MWBE sub-contractors are required to report monthly, by the 10th of each month, to the County through an online system called PRISM. If the contractor cannot submit his/her report on time, he/she will notify the County MWBE office and request additional time to submit the report. Failure of the contractor to report in a timely manner may result in a finding of noncompliance. The County in its sole discretion and/or upon written request may require additional reports regarding MWBE. In the event you are not able to enter your payments in PRISM, a spreadsheet is attached for your use. Please be sure to list the PO for each invoice/ payment reported and include in your submission any corresponding documentation (e.g. copies of invoices or cancelled checks).

Retaining Records: All MWBE records must be retained for 3 years following the expiration or any earlier termination of the contract and shall be available for inspection and photocopying by the County.

Investigation and Notification: Whenever the County believes the bidder/offers, contractor, or any subcontractor may not be operating in compliance with the MWBE requirements, the County may, in its sole discretion, conduct an investigation. If the County finds the bidder/offers, contractor, or any subcontractor is not in compliance with the MWBE requirements, the County may exercise any and all rights and remedies available to the County, under the contract, at law or equity, as deemed applicable and appropriate by the County in its sole discretion.

BALTIMORE COUNTY, MARYLAND

MWBE PARTICIPATION SUMMARY

DETERMINATION OF BID RESPONSIVENESS

Request for Deviation: If the bidder/offeror is unable to procure from MWBE firms (by subcontract or otherwise), supplies and services, any combined value of which equals the required percentage of the total value of the contract, the bidder/ offeror may request, in writing, a deviation or waiver of the contract requirements. To obtain such a waiver, the bidder/ offeror must submit the following information at the time bids are due:

1. The request for waiver request shall include (1) a signed unavailability statement (Form D) executed by all MBEs and WBEs that the bidder/offeror solicited for participation and (2) Outreach Efforts/Compliance Statement (Form E) that demonstrates the bidder/offeror's good faith efforts to comply with the contract requirements, including copies of solicitation documentation to all potential subcontractors:
2. Emails, letters, facsimile transmittals and confirmations containing plans, specifications, and anticipated time schedule for portions of the work to be performed and meeting notes and agendas clearly identifying the certified MBE or WBE classification and dates that the bidder/offeror contacted each MWBE; and
3. Telephone logs containing names, addresses, dates, telephone numbers, work to be performed, anticipated time schedule and classification of certified MBEs and WBEs contacted.

Bid Rejection: The failure of any bidder/offeror (including the apparent low bidder/offeror) to provide a responsive MWBE Plan as required by the solicitation may result in the bidder/offeror being deemed non-responsive and the County's rejection of the bid.

Liquidated Damages If the County issues a notice of intent to awards contract to the apparent low bidder/offeror who provided a responsive MWBE Plan, but, if after said notice and before execution of Contract Documents, it is determined by the County that the apparent low bidder/offeror has failed to comply with the MWBE Plan, such failure may result in the recommendation by the appropriate Procurement Official to annul the award and forfeit the bidder/offeror's Proposal Guaranty to the County, not as a penalty, but as liquidated damages, it being acknowledged that actual damages will be difficult if not impossible to accurately measure. In addition, the County may proceed as it determines to be in its best interest, including but not limited to, the Notice of Award may be made to the next lowest responsive and responsible bidder/offeror or the work may be re-advertised.

Contract Breach: If, after execution of a County contract, the contractor becomes aware it may or will fail to fulfill the applicable MWBE requirements and/or may or will deviate from the contractor's bid response/contract terms, the contractor shall promptly advise the County of this in writing. Thereafter, the County will determine what action or remedy is appropriate on a case-by-case basis, in the County's sole discretion.

Approval Required for Changes: Any and all changes to the MWBE subcontractors or the type or amount of work to be performed by such subcontractors during the contract term must be mutually agreeable to the County and the contractor and shall be documented via a contract amendment, executed by legally authorized representatives of the County and the contractor.

Cooperation in Reviews: The bidder/offeror will cooperate with the County in any reviews of the contractor's procedures and practices with respect to MBE or WBE firms, which the County may from time to time conduct in its sole discretion.

Other: If the documents used to determine the contractor's efforts, achievement of, and/or the status of an MWBE requirement or fulfillment thereof contain false, misleading or misrepresented information, the contractor may be declared in breach of the contract and the County may take any and all actions and/or remedies available to the County under the contract, at law, or in equity. If an MWBE is disqualified by any public entity, including but not limited to, Baltimore City, the State or MDOT, at any time after award or during the term of the contract, the County may, in its sole discretion, require the prime contractor to promptly submit for County approval, the contractor's plans for fulfilling the required MWBE participation under the contract, and/or request such detail and additional information as the County, in its discretion deems appropriate.



PRIME CONTRACTOR MINORITY AND WOMEN PARTICIPATION AFFIDAVIT

A. AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the [title]_____ and the duly authorized representative of
[business]_____
_____ (the "Business") and that I possess the legal authority to make this
Affidavit on behalf of myself and the Business for which I am acting.

B. AFFIRMATION REGARDING MINORITY AND WOMEN PARTICIPATION

I FURTHER AFFIRM THAT:

I am aware that, pursuant to the December 6, 2022 Executive Order of Baltimore County, Maryland, the following words have the meanings indicated.

(A) "Minority Business Enterprise" or "MBE" means a business enterprise that is owned, operated and controlled by one or more minority group members (African American, Hispanic American, Asian American, or Native American) who have at least 51% ownership and in which the minority group members have operational and managerial control, interest in capital and earnings commensurate with their percentage of ownership.

(B) "Women's Business Enterprise" or "WBE" means a business enterprise that is owned, operated and controlled by one or more women who have at least 51% ownership and in which the women have operational and managerial control, interest in capital and earnings commensurate with their percentage of ownership.

_____ The Prime is a MBE ☐ or WBE ☐

☐ Maryland State Department of Transportation (MDOT) # _____

☐ City of Baltimore # _____

☐ Name Other Jurisdiction: _____ # _____

☐ The ownership of the Noncertified MWBE business consists of _____ % minorities and _____ % women (for a total of _____ %), each of which has operational and managerial control, interest in capital and earnings commensurate with their percent ownership.

_____ % African American _____ % Hispanic American _____ % Women
_____ % Asian American _____ % Native American _____ % Disadvantaged (DBE)

_____ The MWBE prime anticipates meeting up to 50% of the stated participation goal with its own workforce.

MWBE primes percentage must be stated on the MWBE PRIME PARTICIPATION SCHEDULE (FORM B-PRIME) to count towards the goal.

_____ The prime anticipates ☐ does not anticipate ☐ utilizing subcontractors for _____ % of the work of the contract requirements, of which it anticipates _____ % will be MBEs and _____ % will be WBEs.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

Date: _____

By: _____

(Authorized Representative and Affiant's Name and Title)

BALTIMORE COUNTY, MARYLAND
Certified MWBE Utilization and Fair Solicitation Affidavit
(FORM A)

**This document must be completed and submitted with Bid/Proposal to Baltimore County.*

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

* * * * *

I acknowledge the goal for solicitation # 25053 PO0 is a minimum of 20 %. This goal must be met by any combination of the MWBE subcontractors. However, for instances where the Prime is counting up to 50% of the goal, the remaining goal balance must be met by any combination of the MWBE subcontractors.

- The goal breakdown is as follows:
 - _____ % Minority/Women Prime
 - _____ % for certified MBE-owned businesses and/or
 - _____ % for certified WBE-owned businesses.

I have made a good-faith effort to achieve this MWBE solicitation requirement. If awarded the contract, I will comply with this MWBE contract requirement and will continue to use my best efforts to increase MWBE participation during the contract term.

PLEASE CHECK ONE BOX (EITHER 1, 2, OR 3)

1 ☐ Prime has met the MWBE contract requirements for this solicitation and contract. I submit the Subcontractor Participation Form B and Form C, along with this Affidavit, which details how the Prime will achieve the contract requirements. Submit a complete list of all additional subcontractors

Or

2 ☐ After having made a good-faith effort to achieve the MWBE requirements, the Prime can only achieve partial success. I submit the Subcontractor Participation Form B, Form C, Form D and Form E along with this Affidavit, which details how the Prime will partially achieve the contract requirements. Submit a complete list of all additional subcontractors

I request a partial waiver and will meet the following MWBE participation goals:

- Partial waiver of MWBE subcontract participation:
 - _____ % Minority/Women Prime
 - _____ % for certified MBE-owned businesses and/or
 - _____ % for certified WBE-owned businesses.

Or

3 ☐ After having made a good faith effort to achieve the MWBE requirements for this contract, the Prime is unable to achieve the requirements and/or sub requirements for this contract. I submit the MWBE Participation Form D and Form E, along with this Affidavit, which details the steps the Prime has taken in an attempt to achieve the contract requirements. Therefore, I request a full waiver.

IF YOU HAVE CHECKED BOX 2 OR 3, THE FOLLOWING IS APPLICABLE:

- 1) If a bidder is unable to comply with the goals established in a bid for a project, the bidder may submit a request for a waiver at the time of bid submission. However, occasions for granting waivers will be limited.

BALTIMORE COUNTY, MARYLAND
Certified MWBE Utilization and Fair Solicitation Affidavit
(FORM A)

- 2) The request for waiver shall include documentation that demonstrates the bidder's good faith efforts to comply with the goals, including:
- a. Signed unavailability statements from all MBEs and WBEs that the bidder solicited for participation; and
 - b. Copies of solicitation documentation to include the scope of services to be performed by the subcontractors accompanied with the following:
 - i. Emails, letters, facsimile transmittals and confirmations containing plans, specifications, and anticipated time schedule for portions of the work to be performed and meeting notes and agendas clearly identifying the certified MBE or WBE classification and dates that the bidder contacted each; and
 - ii. Telephone logs containing names, addresses, dates, telephone numbers, work to be performed, anticipated time schedule and classification of certified MBEs and WBEs contacted.
 - iii. Responses from MWBE firms contacted to fulfill the goal.

As I have checked Box 2 or 3 of this Affidavit, I understand I must submit the following supporting documentation with the bid:

- *Subcontractor Participation Schedule* (Form B)
- *MWBE Subcontractor Disclosure and Participation Statement* (Form C)
- *MWBE Subcontractors Unavailable Certificate* (Form D) (if applicable)
- *MWBE Outreach Efforts – Compliance Statement* (Form E) (if applicable)

I acknowledge that the MWBE subcontractors/suppliers listed on the *Subcontractor Participation Schedule* (Form B) will be used to accomplish the percentage of MWBE participation that the Prime shall achieve. A fully executed Form C must match Form B.

In the solicitation of subcontract quotations or offers, MWBE subcontractors were provided the same information and amount of time to respond, as were non-MWBE subcontractors.

The solicitation process was conducted in such a manner so as to not place MWBE subcontractors at a competitive disadvantage to non-MWBE subcontractors.

I solemnly affirm under the penalties of perjury that this Affidavit is true to the best of my knowledge, information, and belief.

Bidder/Offeror Name

Phone Number

Address

Affiant Signature

Address (continued)

Printed Name & Title

E-mail address

Date

BALTIMORE COUNTY, MARYLAND
SUBCONTRACTOR PARTICIPATION
SCHEDULE (FORM B)

*This document must be completed and submitted with Bid/Proposal to
 Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

Prime Name Bid/Proposal Name and Number 1. Subcontractor Name and Tax ID Telephone Number _____ Email Address _____ Select One: <input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SBE <input type="checkbox"/> N/A Provide if Applicable: <input type="checkbox"/> MDOT <input type="checkbox"/> Baltimore City # _____	Prime Address, Telephone Number and Email Project Location Base Bid \$ _____ Subcontractor Address Minority Status (If applicable): <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> African American <input type="checkbox"/> Asian American Pacific <input type="checkbox"/> Asian American Sub-continent <input type="checkbox"/> Supplier, Wholesaler and/or Regular Dealer - 60% Rule </div> <div> <input type="checkbox"/> Female <input type="checkbox"/> Native American <input type="checkbox"/> Hispanic American </div> </div>
NAICS Code(s), Work to be Performed and Subcontract Dollar Amount 2. Subcontractor Name and Tax ID Telephone Number _____ Email Address _____ Select One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SBE <input type="checkbox"/> N/A <input type="checkbox"/> Provide if Applicable: <input type="checkbox"/> MDOT <input type="checkbox"/> Baltimore City # _____	Percent of Total Contract (See instructions on Page 1 of the MWBE PARTICIPATION SUMMARY for 60% rule) _____% Subcontractor Address Minority Status (If applicable): <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> African American <input type="checkbox"/> Asian American Pacific <input type="checkbox"/> Asian American Sub-continent <input type="checkbox"/> Supplier, Wholesaler and/or Regular Dealer - 60% Rule </div> <div> <input type="checkbox"/> Female <input type="checkbox"/> Native American <input type="checkbox"/> Hispanic American </div> </div>
NAICS Code(s), Work to be Performed and Subcontract Dollar Amount 3. Subcontractor Name and Tax ID Telephone Number _____ Email Address _____ Select One: MBE <input type="checkbox"/> WBE <input type="checkbox"/> SBE <input type="checkbox"/> N/A <input type="checkbox"/> Provide if Applicable: <input type="checkbox"/> MDOT <input type="checkbox"/> Baltimore City # _____	Percent of Total Contract (See instructions on Page 1 of the MWBE PARTICIPATION SUMMARY for 60% rule) _____% Subcontractor Address Minority Status (If applicable): <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> African American <input type="checkbox"/> Asian American Pacific <input type="checkbox"/> Asian American Sub-continent <input type="checkbox"/> Supplier, Wholesaler and/or Regular Dealer - 60% Rule </div> <div> <input type="checkbox"/> Female <input type="checkbox"/> Native American <input type="checkbox"/> Hispanic American </div> </div>
NAICS Code(s), Work to be Performed and Subcontract Dollar Amount Subcontractor Total Dollar Amount \$ _____	Percent of Total Contract (See instructions on Page 1 of the MWBE PARTICIPATION SUMMARY for 60% rule) _____% Total Subcontractor Percent of Entire Contract _____%
Form Prepared by: Name/Date: _____ Title: _____ Email: _____	Reviewed and Accepted by Baltimore County Minority Business Enterprise Office Name _____ Title _____ Date _____

MBE or WBE Prime Participation Total	_____ %	\$ _____	
MBE Subcontracting Participation Total	_____ %	\$ _____	
WBE Subcontracting Participation	_____ %	\$ _____	
Total MWBE Participation	_____ %	\$ _____	
Total SBE Participation	_____ %	\$ _____	

BALTIMORE COUNTY, MARYLAND

**MWBE PRIME PARTICIPATION SCHEDULE
(Form B-Prime)**

PLEASE COMPLETE AND SUBMIT THIS FORM TO ATTEST EACH SPECIFIC ITEM OF WORK THAT YOU AS THE MWBE PRIME FIRM WILL PERFORM USING ITS OWN WORKFORCE PERTAINING TO THE PERCENTAGE STATED ON THE SUBCONTRACTOR PARTICIPATION SCHEDULE (FORM B) FOR PURPOSES OF MEETING THE MWBE PARTICIPATION GOALS.

**This document must be completed and submitted with Bid/Proposal to Baltimore County.*

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

Provided that _____ (Prime Contractor's Name) with Certification Number _____ is awarded the County contract in conjunction with Solicitation No. _____, such MWBE Prime Contractor intends to count the distinct, clearly defined portion of the work of the contract that the MBE/WBE Prime Contractor performs with its own forces toward fulfilling **up to fifty-percent (50%) of the MWBE participation goal**, at least \$ _____ which equals to _____% of the Total Contract Amount for performing the following products/services for the Contract:

NAICS CODE	WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE). FOR CONSTRUCTION PROJECTS, GENERAL CONDITIONS MUST BE LISTED SEPARATELY.	DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES	VALUE OF THE WORK

MWBE PRIME CONTRACTOR

Signature of Representative: _____

Printed Name and Title: _____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

Telephone: _____

Email Address: _____

Certified Yes No No

Certifying Jurisdiction _____

Date: _____

MWBE PRIME CONTRACTOR

Minority Status:

☐ African American

☐ Hispanic American

☐ Women

☐ Asian American

☐ Native American

Reviewed and Accepted by Baltimore County Minority Business Enterprise Office

Name _____

Title _____

Date _____

BALTIMORE COUNTY, MARYLAND
MWBE SUBCONTRACTOR DISCLOSURE AND PARTICIPATION STATEMENT
(FORM C)

**This document must be completed and submitted with Bid/Proposal to Baltimore County.*

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

NOTE: ANY INCONSISTENCY BETWEEN THIS FORM AND FORM B MWBE PARTICIPATION MAY RENDER A BID/PROPOSAL NON-RESPONSIVE AND THE COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

Contract Name, Bid/Proposal Number: _____

Prime Contractor Name: _____

Name of MWBE Subcontractor: _____

Subcontractor Contact Name, Title _____

Subcontractor Email Address _____

☐ MDOT ☐ Baltimore City

_____ Certification Number

☐ MBE ☐ WBE ☐ SBE ☐ N/A

1. NAICS Code(s), Work/Services to be performed by MWBE Subcontractor: _____

Percent of Total Contract (See instructions on Page 1 of the MWBE PARTICIPATION SUMMARY for 60% rule)

2. Subcontract Amount: \$ _____ or _____ % of the County contract cost.

3. Bonds - Amount and type required of Subcontractor if any: _____

4. MWBE Anticipated Commencement Date: _____ Completion Date: _____
Mobilization Cost Amount \$ _____

5. This is a MBE-Owned Business Firm: Yes _____ No _____

6. This is a WBE-Owned Business Firm: Yes _____ No _____

NOTE: If the Prime is notified that it will be awarded the above referenced contract, the undersigned MWBE subcontractor and Prime must enter into a subcontract for the work/service indicated above upon the Prime's execution of a contract for the above referenced project with Baltimore County, and provide a copy of the fully executed MWBE SUBCONTRACTOR PARTICIPATION NOTICE OF INTENT TO AWARD (FORM C-Subcontractor) accompanied with the anticipated Work Breakdown Schedule (providing the subcontractor's mobilization timeframe) to mwbe@baltimorecountymd.gov within 10 calendar days of receipt by the Prime of FORM C- Subcontractor from the County. The undersigned subcontractor is an MDOT or Baltimore City certified MWBE firm. The terms and conditions stated above are consistent with our agreements.

Signature of MWBE Subcontractor: _____ Date: _____

Prime's Printed Name and Title: _____ Email: _____

The terms and conditions stated above are consistent with our agreements.

Signature of Prime: _____ Date: _____

Revised 12/2024

BALTIMORE COUNTY, MARYLAND
MWBE –UNAVAILABILITY CERTIFICATE
(FORM D)

If applicable, this document must be completed and submitted with Bid/Proposal to Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

1. It is hereby certified that the firm of _____
(Name of Minority firm)

located at _____
(Number) (Street)

(City) (State) (Zip)

was offered an opportunity to bid on the _____ contract.

2. The _____ (MWBE Firm), is either unavailable for the work/service or unable to prepare a bid for this project for the following reason(s):

Signature of Subcontractor MWBE Representative

Title

Date

MDOT/Baltimore City Certification #

Email Address #

Telephone #

3. PRIME'S SIGNATURE AND CERTIFICATION

I certify under oath that I contacted the Certified MWBE and they advised me that they are unavailable, unable to perform the work/services for the above-contract or failed to respond to repeated requests for a price proposal for the above-contract.

Signature of Prime

Title

Date

Rev 12/2024

BALTIMORE COUNTY, MARYLAND
MWBE - OUTREACH EFFORTS - COMPLIANCE STATEMENT
(FORM E)

****This document must be completed and submitted with Bid/Proposal to Baltimore County.***

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

In conjunction with the bid or offer submitted in response to Solicitation Number _____, I state the following:

1. Bidder/Offeror identified opportunities to subcontract in these specific work categories:

2. Attached to this form are copies of the solicitation documentation in accordance with Section 6 (E) Bid Requirements of the Executive Order, used to solicit certified MWBEs for the subcontract opportunities accompanied with the signed MWBE Subcontractor Unavailability Certificate (Form D).

3. Bidder/Offeror made the following attempts to solicit MWBEs:

Signature – Bidder Offeror

Print or Type Name of Firm

Street Address

City State Zip Code

Date



JOHN A. OLSZEWSKI, JR.
County Executive

SEVETRA PEOPLES-BROWN
Executive Director
Chief of Diversity, Equity and Inclusion

To: Contractors/Consultants

From: Minority and Women Business Enterprise Office

Date: December 13, 2024

Subject: Compliance Reporting and Penalties

Baltimore County, Maryland (the "County") requires all Prime Contractors and all Subcontractors to submit payment reports by the 10th of each month through an online MWBE Compliance Portal (PRISM). The Portal can be found under Compliance Reporting for Primes and Subcontractors at www.baltimorecountymd.gov/go/mwbe. In the event you are not able to enter your payments in PRISM, a spreadsheet is attached for your use. Please be sure to list the PO for each invoice/ payment reported and include in your submission any corresponding documentation (e.g. copies of invoices or canceled checks).

The County has found that a number of companies are failing to file reports in a timely manner, which makes it difficult for the County to verify compliance. As a result, the County has determined to assess penalties for non-compliance, effective September 1, 2018, as follows:

- (a) For failure to file timely monthly reports:
 - a. Assessment of a late fee of \$10 per day per task, up to a maximum of \$1,500 per task; and/or
 - b. For multiple violations, termination of the contract for convenience or for default, with the contractor suspended from participating in County contracts for five (5) years.
- (b) For failure to meet MWBE requirements:
 - a. Assessment of a penalty of up to 10% of the contract value; and/or
 - b. Termination of the contract for convenience, with the contractor suspended from participating in County contracts for five (5) years together with assessment of a penalty of up to 10% of the contract value; and/or
 - c. Termination of the contract for default together with assessment of a penalty of 10% of the contract value.

Each action and/or remedy described above is at the sole discretion of the County, and is in addition to any damages which the County may be entitled to under the contract. This short video can be used as guidance on submitting the Prime to Subcontractor Payment Reporting:

http://stage.prismcompliance.com/etc/movies/vendor_contractpayment_tutorial.htm

If after contract expiration, it has been determined the MWBE firms named were not used or were under used, by the contractor and supporting documentation was not provided and approved by the County the contractor may be assessed a penalty of up to 10% of the contract value and/or suspended from participating in County contracts for 5 years.

Questions regarding this correspondence and/or the use of this system can be directed to the MWBE Office at mwbe@baltimorecountymd.gov or call (410) 887-3407.

Attachment: MWBE Payment Report Form
 MWBE Payment Acknowledgement Form

Cc: File

S E C T I O N V

POST AWARD DOCUMENTS

**This Section to be Completed
by Successful Bidder after Award**

CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT ("Contract"), IS MADE THIS _____ day of _____ 20____, by and between Baltimore County, Maryland, a body corporate and politic ("County"), and _____, ("Contractor").

WITNESSETH, that the Contractor, for and in consideration of the payment or payments herein specified and agreed to by the County, hereby covenants and agrees to furnish and deliver all the materials and to do and perform all the work, services, and labor in fulfillment of the requirements of Contract Number **25053 PO0** "Project") in strict conformity with the solicitation, plans, specifications, special provisions, any and all addenda, and the proposal, at the prices named therein, and all of which are collectively the Proposal, and said Proposal is attached hereto and made a part thereof.

The Project shall be done in strict compliance with (i) the Proposal, (ii) the Baltimore County Department of Public Works and Transportation September 2023 "Standard Specifications for Construction and Materials" and "Standard Details for Construction" (iii) and any and all revisions thereto as of the date of advertisement, including but not limited to the General Conditions Building Projects, as applicable, and all of which (i-iii) are made a part hereof and incorporated herein (collectively, the "Specifications"). Contractor understands and agrees it is Contractor's responsibility and obligation to obtain a copy of the "Specifications" and agrees the Specifications are incorporated herein. Copies are available on the County's website at www.baltimorecountymd.gov/departments/public-works/standards.

The Project shall be subject to the inspection and approval of the Office of Budget and Finance – Property Management for Baltimore County, or his authorized representative, and in the event any portion thereof shall be rejected by said Director or his representative as defective or unsuitable, then the said portion shall be removed and replaced and be performed anew to the satisfaction and approval of the said Director or his representative at the cost and expense of the Contractor.

THE CONTRACTOR AFFIRMS that it is aware of, and will comply with, the provisions of Sections 14-101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, as the same may be amended from time to time, which require that every person who makes, during any 12-month period, one or more contracts, with one or more Maryland governmental entities involving cumulative consideration, of at least \$200,000.00, to file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of \$500 during defined reporting periods.

THE CONTRACTOR FURTHER COVENANTS AND AGREES that all the Project shall be furnished, performed and delivered, in every respect, to the satisfaction and approval of the Office of Budget and Finance – Property Management, aforesaid, on or before the expiration of **One Hundred Fifty (150) CALENDAR DAYS** (the "Contract Period") after written notice has been given by the Director or their authorized representative to begin the work.

IT IS AGREED THAT TIME IS OF THE ESSENCE. In the event the Contractor fails to achieve Final Completion and Final Acceptance of the Contract work within the Contract Period specified herein, plus any extensions thereto agreed to in writing by a legally authorized representative of the County pursuant to the terms of this Contract, then Contractor shall pay the County the sum of **FIFTEEN HUNDRED DOLLARS (\$1500.00)** as Liquidated Damages for each **CALENDAR DAY** after the expiration of the Contract Period, as may be extended by the County, until the Contractor achieves Final Completion and Final Acceptance of the Project.

Contractor's Initials

Date

Rev. 09/2024

IT IS FURTHER AGREED that:

- (a) These Liquidated Damages are a reasonable estimate of the County's damages solely due to the public's loss of use of the Project during the delay period and is not a penalty.
- (b) It is very difficult, if not impossible, to accurately measure the damages to the County due to the public's loss of use of the Project during the delay period.
- (c) Notwithstanding GP 8.09 of the Baltimore County Standard Specification for Construction, in addition to the damages due to the public's loss of use of the Project during the delay period, the County is likely to incur additional direct costs during the delay period, including but not limited to, costs for construction management, consultants, architectural services, office trailer and supplies, utilities, County employees' time, County vehicles, and such other costs that the County will incur to continue administration of the construction and the Contract during the delay period, all of which will be monitored by the County, and if so required by the County, the Contractor shall pay such actual damages incurred during the delay period. THE PARTIES HERETO UNDERSTAND AND AGREE THAT CONTRACTOR'S OBLIGATION TO PAY THE COUNTY FOR ACTUAL DAMAGES DURING THE DELAY PERIOD SHALL BE IN ADDITION TO THE CONTRACTOR'S OBLIGATION TO PAY THE LIQUIDATED DAMAGES DUE TO THE PUBLIC'S LOSS OF USE OF THE PROJECT.
- (d) The County shall have the right, but not the obligation, to deduct the Liquidated Damages due to the public's loss of use of the Project, and the County's actual costs and costs to continue administration of the construction and the Contract, from any monies due or any monies that may become due to the Contractor.

IT IS DISTINCTLY UNDERSTOOD AND AGREED that no claim for extra work, material or overhead not specifically provided for in the Contract will be allowed by the County, nor shall the Contractor do any work or furnish any materials not covered by this Contract and the Specifications, unless the same is ordered in writing by a legally authorized representative of the Office of Budget and Finance – Property Management in accordance with the terms of the Contract. Any such work or materials which may be done or furnished by the Contractor without any such written order first being given shall be at said Contractor's sole risk, cost and expense and Contractor hereby covenants and agrees that without such written order, Contractor shall make no claim for compensation for work, materials, or overhead so done or furnished.

NOTWITHSTANDING GP 4.06 OF THE BALTIMORE COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION, IT IS SPECIFICALLY AGREED that the Contractor shall have no entitlement to damages arising out of delay, disruption, interference or hindrance from any cause whatsoever. However, this provision shall not preclude recovery or damages by the Contractor for hindrances or delays due solely to fraud or gross negligence on the part of the County or its agents.

IT IS FURTHER DISTINCTLY AGREED that the said Contractor shall not assign this Contract, nor any part thereof, nor any right to any of the monies to be paid hereunder, nor shall any part of the work to be done or material furnished under said Contract be sublet without the prior written consent of a legally authorized representative of the Office of Budget and Finance – Property Management in accordance with the terms of this Contract. Further, the acceptance of the final payment by the Contractor shall effectuate a release in full of all claims against County and its officials, employees, representatives, and agents arising out of, or by reason of the Project and this Contract.

The Contractor shall review government issued identification and badge all employees of the Contractor and its subcontractors. The Contractor shall also review all federal forms, including but not limited to I-9's, for compliance as well as copies of all employment eligibility and identity documentation maintained to the extent required by law.

The Bonds, given by the Contractor in a sum equal to the total contract price of the Project in compliance with the terms and provisions of this Contract, are hereby attached and incorporated herein.

IT IS AGREED that in the event that the County is delayed or prevented from timely execution of this Contract, the Contractor releases County and agrees Contractor shall have no action, claim or demand against County therefore.

Contractor's Initials

Date

Rev. 09/2024

THE CONTRACTOR HEREBY FURTHER AGREES to receive the prices set forth in the Proposal incorporated herein as full compensation for the completion of the Project and, in all respects, to complete said Contract to the satisfaction of the County.

THE CONTRACTOR REPRESENTS AND WARRANTS:

- (i) it is duly formed and validly existing under the laws of the State of _____;
- (ii) it is in good standing in the State of Maryland;
- (iii) it has the power and authority to consummate the obligations and responsibilities contemplated hereby, and has taken all necessary action to authorize the execution, delivery and performance required under this Contract;
- (iv) the Contractor and the person executing this Contract for the Contractor each warrant that he/she is duly authorized by the Contractor to execute and seal this Contract on the Contractor's behalf;
- (v) the warranties of merchantability and fitness for a particular purpose and use and warranties of title and against infringement, and all express warranties contained in this Contract, including but not limited to the Proposal (and any sample or model presented by Contractor and expressly accepted by the County) shall apply to the portion of this Contract pertaining to or for goods;
- (vi) all representations and warranties made in the Proposal and herein remain true and correct in all respects when made, as of the date of this Contract, and throughout the term of this Contract; and
- (vii) there exists no actual or potential conflict of interest between its performance under this Contract and its engagement or involvement in any other personal or professional activities and in the event such conflict or potential conflict arises during the term of this Contract, the Contractor shall immediately advise the County in writing thereof.

THE CONTRACTOR shall not disclose any documentation and information of any kind or nature disclosed to the Contractor in the course of its performance of duties hereunder without the express prior written consent of the County.

Those sections in this Contract which by their nature are intended to survive, including but not limited to, Contractor's representations and warranties, confidential information, and indemnification shall survive the termination of this Contract.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand and seal the day and year first above written.

CONTRACTOR NAME: _____

WITNESS FEDERAL TAX ID or SS #: _____

By: _____ (Seal)

Name: _____

Type (Print) Name

Title: _____ Date: _____

WITNESS: **BALTIMORE COUNTY, MARYLAND**

Executive Secretary By: _____ Date: _____
D'Andrea L. Walker, County Administrative Officer

Type (Print) Name

APPROVED FOR FORM AND LEGAL
AND SUFFICIENCY* (Subject to
execution by the duly authorized
Administrative official and Chairperson
of the County Council, as indicated).

APPROVED:

Kevin D. Reed, Director
Office of Budget and Finance Date: _____

Office of the County Attorney

*Approval of Form and Legal Sufficiency does not convey approval or disapproval of the substantive nature of this transaction. Approval is based upon typeset documents. All modifications require re-approval.

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PERFORMANCE BOND

Bond No. _____

Principal _____

Business Address of Principal _____

Surety _____

Obligee: **BALTIMORE COUNTY, MARYLAND**
A body corporate and politic

A Corporation of the State of _____ and authorized to do business in Maryland

Penal Sum of Bond (express in words and figures)

Glen Arm Maintenance Facility Sign & Signal HVAC Replacement

Contract Name

25053 PO0

Contract Number

DOLLARS

\$

20

Date of Contract

20

Date Bond Executed

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL, above-named, and SURETY, above-named, and authorized to do business in the State of Maryland, are held and firmly bound unto the OBLIGEE, above-named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE PRINCIPAL entered into a certain contract with the OBLIGEE described and dated as shown above and is required to provide this bond pursuant to Maryland State law and/or County law and the contract.

NOW, THEREFORE, if the aforesaid PRINCIPAL shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the OBLIGEE with or without notice to the SURETY, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then, this obligation to be void; otherwise to remain in full force and effect.

THE SURETY FURTHER GUARANTEES That it is (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. A Performance Bond is required for each and every Contract in excess of twenty-five thousand (\$25,000). A Performance Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Performance Bond shall be delivered by the Bidder to the Department's Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and seal of each party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of:**Individual Principal**

Witness: _____

as to: _____ (SEAL)

Print Name: _____

Print Name: _____

Attest:**Corporate Principal**

(Name of Corporation)

Witness: _____

By: _____ Affix

Print Name: _____

Print Name: _____ Corporate

Title: _____ Seal

Attest:**Surety**

(Name of Surety)

Business Address: _____

Witness: _____

By: _____ Affix

Print Name: _____

Print Name: _____ Corporate

Title: _____ Seal

Reviewed for Baltimore County Requirements

Office of the County Attorney

PAYMENT BOND

Bond Number _____

Principal _____

Business Address of Principal _____

Surety _____

Obligee: **BALTIMORE COUNTY, MARYLAND**
A body corporate and politic

A Corporation of the State of _____ and authorized to do business in Maryland

DOLLARS \$ _____

Penal Sum of Bond (express in words and figures) _____

Glen Arm Maintenance Facility Sign & Signal HVAC Replacement
Contract Name

Date of Contract 20 _____

25053 PO0
Contract Number

Date Bond Executed 20 _____

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL, above-named, and SURETY, above-named, and authorized to do business in the State of Maryland, are held and firmly bound unto the OBLIGEE, above-named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE PRINCIPAL entered into a certain contract with the OBLIGEE described and dated as shown above and is required to provide this bond pursuant to Maryland State law and/or County Law and the contract.

NOW, THEREFORE, the condition of this obligation is such that if the aforesaid PRINCIPAL shall promptly make payments to all persons supplying labor and/or material to the PRINCIPAL and to any subcontractor of the PRINCIPAL in the prosecution of the work provided for in said contract and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then, this obligation to be void; otherwise to remain in full force and effect.

THE SURETY FURTHER GUARANTEES That it is (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. A Payment Bond is required for each and every Contract in excess of twenty-five thousand (\$25,000). A Payment Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Payment Bond shall be delivered by the Bidder to the Department's Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and seal of each party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of:

Individual Principal

Witness: _____

as to: _____ (SEAL)

Print Name: _____

Print Name: _____

Attest:

Corporate Principal

(Name of Corporation)

Witness: _____

By: _____ Affix

Print Name: _____

Print Name: _____ Corporate

Title: _____ Seal

Attest:

Surety

(Name of Surety)

Business Address: _____

Witness: _____

By: _____ Affix

Print Name: _____

Print Name: _____ Corporate

Title: _____ Seal

Reviewed for Baltimore County Requirements

Office of the County Attorney



INSURANCE PROVISIONS

1. GENERAL REQUIREMENTS

- 1.1 Coverages Required:
Unless otherwise required by the specifications or the contract, the Contractor/Vendor shall purchase and maintain the insurance coverage's listed herein.
- 1.2 Certificate of Insurance:
Before starting work on the contract, or prior to the execution of the Contract on those bid, the Contractor/Vendor shall provide Baltimore County, Maryland with verification of insurance coverage evidencing the required coverages.
- 1.3 Baltimore County as Insured:
The coverage required, excluding Workers' Compensation and Employers' Liability and Medical Malpractice Liability/Professional Liability/Errors and Omissions Liability, must include Baltimore County, Maryland and its agents, employees, officers, directors, and appointed and elected officials as an additional insured.
- 1.4 Contractor's/Vendor's Responsibility:
The providing of any insurance herein does not relieve the Contractor/Vendor of any of the responsibilities or obligations the Contractor/Vendor has assumed in the contract or for which the Contractor/Vendor may be liable by law or otherwise.
- 1.5 Failure to Provide Insurance:
Failure to provide and continue in force the required insurance shall be deemed a material breach of the contract. The Contractor/Vendor must maintain the insurance coverages required under the terms and conditions on this Contract while this Contract is in effect including renewal and extension terms.

2. INSURANCE COVERAGES

- 2.1 General Liability Insurance
- 2.1.1 Minimum Limits of Coverage:
Personal Injury Liability and Property Damage Liability
Combined Single Limit - \$500,000 each occurrence.
- 2.1.2 Such insurance shall protect the Contractor/Vendor from claims which may arise out of, or result from, the Contractor's/Vendor's operations under the contract, whether such operations be by the Contractor/Vendor, any subcontractor, anyone directly or indirectly employed by the Contractor/Vendor or Subcontractor, or anyone for whose acts any of the above may be liable.
- 2.1.3 Minimum Coverages to be Included:
(a) Independent Contractor's coverage;
(b) Completed Operations and Products Liability coverage;
(c) Contractual Liability coverage.

- 2.1.4 Damages not to be Excluded:
Such insurance shall contain no exclusions applying to operations by the Contractor/Vendor or any Subcontractor in the performance of the Contract including but not limited to:
(a) Collapse of, or structural injury to, any building or structure;
(b) Damage to underground property; or
(c) Damage arising out of blasting or explosion.

2.2 Automobile Liability Insurance

- 2.2.1 Minimum Limits of Coverage:
Bodily Injury Liability and Property Damage Liability
Combined Single Limit - \$500,000 any one accident.
- 2.2.2 Minimum Coverages to be Included:
Such insurance shall provide coverage for all owned, non-owned and hired automobiles.

2.3 Workers' Compensation and Employers' Liability Insurance

Such insurance must contain statutory coverage, including
Employers' Liability insurance with limits of at least:
Bodily Injury by Accident - \$250,000 each accident
Bodily Injury by Disease - \$500,000 policy limit
Bodily Injury by Disease - \$250,000 each employee

2.4 Valuable Papers and Records Coverage and Electronic Data Processing (Data and Media) Coverage

Minimum Limits of Coverage:
\$100,000 Per Claim and Each Occurrence
\$100,000 in the Aggregate

2.5 Other

Such other insurance in form and amount as may be customary for the type of business being under taken by the Contractor/Vendor.

2.6 Builder's Risk

See Special Provisions page 328 and General Conditions pages 12-42, Article 33.