FREDERICK COUNTY, MARYLAND

PROCUREMENT & CONTRACTING DEPARTMENT

12 East Church Street, Winchester Hall
Frederick, Maryland 21701

INVITATION FOR BID (IFB) # 18-363-CP

PROJECT MANUAL
For
MYERSVILLE LIBRARY

Bid Due Date:

May 22, 2018 before 2:00 PM

Buyer: Bruce Johnson, CPPO, CPSM, C.P.M.
Phone: (301) 600-6706
Email: bjohnson@frederickcountymd.gov

www.FrederickCountyMD.gov

Myersville Library

8 Harp Place Myersville, Maryland 21773

Project Directory

Owner:

Frederick County, MD
12 E. Church Street
Frederick, MD 21701

Office of Project Management
355 Montevue Lane, Ste. 200
Frederick, MD 21702
(301) 600-2959, Fax (301) 471-4898
Project Manger: Tyler Muntz
tmuntz@frederickcountymd.gov

Frederick County Procurement and Contracting Department
12 E. Church Street
Frederick, MD 21701
(301) 600-6706
Project Manager: Bruce Johnson
bjohnson@frederickcountymd.gov

Engineer/Consultant:

Noelker and Hull Associates, Inc. Architects
6 N East St. #300
Frederick, MD 21701

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INVITATION FOR BIDS
FREDERICK COUNTY BID NO. 18-363-CP
MYERSVILLE LIBRARY

Notice is hereby given that Frederick County, Maryland will receive Sealed Bids from qualified General Contractors in the Department of Procurement and Contracting, Winchester Hall, 12 East Church Street, Frederick, Maryland, 21701 for the Myersville Library project until 2.00 PM (local time) on May 22, 2018, at which time, bids will be opened and publicly read aloud. Bids received after that time and date will not be accepted and returned unopened.

DESCRIPTION OF WORK:

The work is located at the following location:

8 Harp Place Myersville, MD 21773

The Work of this Project is defined by the Contract Documents and includes but is not limited to the following: The construction of a new 6,900 square foot public library facility. The building use is classified as A3 (Assembly). The construction classification is 2B. The facility will include a slab on grade, brick, cementitious lap-siding and curtain wall clad exterior; steel framing with standing seam metal and a TPO roof. Interior partitions will be metal stud with gypsum wall board. Ceiling will include painted drywall, exposed structure and lay-in acoustical ceiling tiles. Work will also include a complete HVAC system, electrical service, lighting, plumbing, plumbing fixtures, and interior finishes. Site work will include grading, utilities (including gas, water, sanitary, stormwater, and electrical), parking lot paving and striping, site lighting, and landscaping. Utility and earthwork shall be unclassified. A fully functioning, temporary construction trailer shall be fully installed and energized with electricity on the date of the selected notice to proceed. Notice to proceed is anticipated to be issued July/August 2018.

WATER METER:

The Town of Myersville will supply the 3" water meter to be installed by the contractor. It is the contractor's full responsibility to install the water meter. The Town will provide their engineer for inspection of the water mater installation.

POTOMAC EDISON POWER:

The site will require a power source which will be installed by Potomac Edison. It shall be the contractor's responsibility to coordinate with Potomac Edison for power installation. The successful contractor is responsible for installing all conduit necessary for power connections.

SPRINKLER/FA/ALARM:

Frederick County will hire an independent contractor (Simplex Grinnell) to install the sprinkler system, fire alarm system, and intrusion alarm system. Simplex Grinnell will install the sprinkler system beginning after the OS&Y gate valve on the discharge side of the backflow preventer. The successful contractor will be responsible for the installation up to this point. Simplex will purchase and install the tamper switches for the (2) backflow OS&Y gate valves, sprinkler riser pipe, sprinkler riser check valve, man drain, flow switch, gauges, and fire department connection. Specifications regarding these systems are for informational purposes only. The selected contractor shall be

responsible for the purchase and installation of the fire extinguishers and associated cabinet. It shall be the successful contractor's responsibility to coordinate and schedule the installation of these systems with Simplex Grinnell.

HVAC:
Frederick County will be responsible for the purchase and installation of the Mitsubishi equipment and its associated ductwork, refrigerant lines, controls, etc. The contractor will be responsible for the electrical connections to the complete HVAC system, including the portion that Frederick County installs. The contractor will be responsible for the plumbing installation associated with the complete HVAC installation, including the portion that Frederick County installs. The contractor will be responsible for the purchase and installation of all exterior wall penetrations, the outside air intake louver and the exhaust air louvers. The 2nd exhaust air louver is for aesthetic purposes only. The contractor will be responsible for the purchase and installation of all other components of the HVAC system. Specifications regarding the Frederick County installation are for informational purposes only. It shall be the successful contractor's responsibility to coordinate and schedule the installation of these systems with Frederick County's installation crew.

IIT NETWORK:
Frederick County IIT installs their own data network. The contractor is responsible for the installation of the single gang device box and ¾"conduit to accessible ceiling space at data connections. Conduit to turn towards interior of room above ceiling. Low voltage conduit run in the slab shall be 1". Refer to electrical drawings for additional details.

MYERSVILLE HISTORIC TROLLEY:
The Town of Myersville will contract and procure the insertion of history Trolley 150 into the library via a contractor selected by the Town. The Trolley is currently located adjacent to the site and will be ready for insertion into the library near the end of the construction project. The Trolley shall be inserted via window ST-14 as defined by the project documents. The contractor is to provide means to secure the building until window ST-14 is installed. It shall be the contractor's responsibility to coordinate and schedule the installation of Trolley 150, with the Town of Myersville and the Frederick County Project Manager. The contractor is to coordinate the Trolley footing pier locations with the Town of Myersville. Refer to sheet S1.1 for additional details.

Frederick County will obtain a building permit for the project. It shall be the successful contractor's responsibility to provide all other applicable permits.

1. Presentation of Bids:
   Presentation of bids shall be in strict accordance with the Instructions to Bidders included in the project Specifications (Section 00100). Bids shall be enclosed in a sealed envelope, addressed to Frederick County and identified as Bid Number 18-363-CP in one envelope which includes:
   - Bid Proposal (Bid Forms Section 00200)
   - Bid Security
   - Bidder Certification of Work Capacity
   - Affidavit of Qualification to Bid
   - Certificate of Compliance with Regulation 1-2-36
   - Affidavit

The Bidder's Name and address should be clearly marked on the outside of the envelope.

2. Obtaining or Inspecting Contract Documents:
   There is no charge for the bid documents. Downloading the Contract Documents will permit the bidder to take Contract Documents to the "print shop" of their choice for printing.

   Bid documents may be obtained as follows:
   - If you are already a registered vendor on the Frederick County Purchasing website, go to Purchasing Construction Page at: http://www.frederickcountymd.gov/index.aspx?nid=1116 and download a copy of the bid.
   - If you are not yet a registered vendor on the Frederick County Purchasing website, go to the vendor registration page at https://ww3.frederickcountymd.gov/VendorSignIn/ and follow the instructions to register.
   - When you have completed the registration, go to the Purchasing Construction Page identified above to download a copy of the bid.

   NOTICE: CONTRACTORS AND SUBCONTRACTORS, THAT DO NOT REGISTER, WILL NOT RECEIVE NOTIFICATION OF ADDENDA; THEREFORE THE COUNTY ASSUMES NO RESPONSIBILITY FOR THE FAILURE OF NON-REGISTERED ENTITIES TO RECEIVE ADDENDUMS.

3. Bid Security and Guarantee is applicable to this project.
   The Contractor shall submit bid security in the form of Bid Bonds, Certified Checks, or Cashier's Checks in the amount of Five Percent (5%) of Bidder's maximum total project bid price. Security shall be made payable to Frederick County, Maryland. Bid Bonds shall be issued by a surety company licensed to conduct business in the State of Maryland and shall be written on EJCDC C-430 Bid Bond (2002 Edition).

4. Performance Bond and Payment Bond are applicable to this project.
   The successful bidder shall furnish performance and payment bonds covering the faithful performance of the Contract and payment of all obligations there under, in the amount of One Hundred Percent (100%) of the total Contract Sum, including Contingency Items and any accepted Alternates (if any of these are included in the bid award). Each Bond shall be issued by a Surety Company licensed to conduct business in the State of Maryland and shall be delivered to the Frederick County Procurement & Contracting Department within ten (10) days after Notice of Award of the Contract. The bonds shall be written on EJCDC C-610 – Performance Bond (2002 Edition) and EJCDC C-615 – Payment Bond (2002 Edition).

5. Time of Completion and Liquidated Damages:
   The Contractor shall commence the Work under this Contract per the construction start date established in the Notice-to-Proceed, prosecute said Work diligently and complete the Work no later than 305 (three hundred and five) calendar days from the construction start date identified in the Notice-to-Proceed.

In case of failure on the part of the Contractor to complete the Work within the time fixed in the Contract or any extensions thereof, the Contractor shall pay the Owners, as fixed and agreed upon liquidated damages, the sum of $1,000.00 (One Thousand Dollars) per calendar day to Frederick County for each calendar day in excess of the Contract Time stated above or as otherwise modified and agreed to by the Owner and Contractor.

6. **MANDATORY Pre-Bid Conference:**

A mandatory Pre-Bid Conference will be held May 1, 2018 at 2:00 PM in the 1st Floor Hearing Room, Winchester Hall, 12 E. Church St. Frederick, MD 21701. The project will be reviewed and questions pertaining to the plans, specifications, and bidding procedures will be addressed. Attendance is required by at least one member of your company who must be sing in at the meeting.

A site visit will not be conducted by the County, however, contractors are encouraged to visit the site independently to familiarize themselves with conditions prevailing at the site.

7. Award or Rejection of Bids:

A bidder may be required to submit evidence that he has appropriate experience, and financial resources available to undertake and perform the Contract properly and expeditiously, and any other information that may be required to indicate his ability to fulfill the Contract. **This may include, but not be limited to, submission of at least three similar projects performed within the last three years** (including the name of the Owner and the name and telephone number of an authorized representative of the Owner familiar with the project). It is the intent of the Owners to award the construction contract to the lowest responsive and responsible Bidder, complying with all the provisions of the Instructions to Bidders, provided the bid price is reasonable and it is to the interest of the Owner to accept it. Frederick County, Maryland reserves the right to cancel the project, at no penalty, up to the issuance of the "Notice to Proceed". Frederick County, Maryland or its authorized agent(s) reserve the right to reject any or all bids and to waive any informality or deficiency in bids received, whenever such rejection or waiver is in the best interest of the County. Frederick County, Maryland also reserves the right to reject the bid of a Bidder who has previously failed to perform properly or to complete, on time, contracts of a similar nature, or the bid of a Bidder, who after investigation, is not in a position to perform the Contract.

As a condition of award the successful Bidder will be required to submit bonds and insurance prior to the execution of the Contract by the Owner. Failure to meet this requirement shall constitute abandonment of the Bid by the Bidder and forfeiture of the bid security. The bid may then be awarded to the next lowest bidder.

8. Bid Protest:

The County's Bid Protest Procedure may be accessed at:
http://www.frederickcountymd.gov/index.asp?nid=1116 Frederick County Government does not discriminate on the basis of race, color, national origin, sex, religion, age and disability in employment or the provision of services.

Individuals requiring special accommodations are requested to contact the Purchasing Department at (301) 600-1067 (Voice), or (301) 600-1672 (Voice/TDD) to make arrangements no later than ten (10) working days prior to the meeting.

9. Solicitation Administration:
   All communications relative to the bid for this Work shall be directed to Bruce Johnson (301-600-6706), Procurement Project Manager IV prior to the opening of Bids. All questions relating to interpretation of the Contract Documents or requests for clarification must be submitted in writing. E-mail: bjohnson@frederickcountymd.gov or Fax 301-600-2521 **no later than May 11, 2018**.

BY AUTHORITY OF:

Frederick County, Maryland
Diane Fouche, Director of Procurement & Contracting

SECTION 00100 - INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DESCRIPTION

A. The "Instructions to Bidders," EJCDC Document C-200, Version 2002, herein referred to as the INSTRUCTIONS TO BIDDERS, as modified, shall govern the bidding. The modified EJCDC C-200 is attached.

END OF SECTION 00100

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

ACEC
American Council of Engineering Companies

National Society of Professional Engineers
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ASCE American Society of Civil Engineers

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American Council of Engineering Companies
1015 15th Street, N.W., Washington, DC 20005

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400

INSTRUCTIONS TO BIDDERS

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ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office*--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered. The Frederick County Department of Procurement and Contracting is fulfilling the role of the *Issuing Office*. Their mailing address is 12 East Church Street, Frederick, Maryland, 21701.
B. *Engineer* – The design firm who was contracted by Frederick County to produce the project specific construction documents
C. *Owner* – The individual or entity with whom the Contractor has entered into the Agreement and for whom the Work is to be performed.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents can be obtained from the Issuing Office. There is no charge for the bid documents. Downloading the Contract Documents will permit the bidder to take Contract Documents to the "print shop" of their choice for printing.

Bid documents may be obtained as follows:

- If you are currently registered to receive bid announcements on the Frederick County Procurement and Contracting website, go to the Current Solicitations Page at:
  https://www.frederickcountymd.gov/1116/Current-Solicitations
  and download a copy of the bid.
- If you are <u>not</u> yet registered to receive bid announcements on the Frederick County Procurement and Contracting website, go to:
  https://ww4.frederickcountymd.gov/VendorSignIn/
  and follow the instructions to register.
- When you have completed the bid announcement registration, go to the Current Solicitations Page identified above to download a copy of the bid.

- Supplier registration in Frederick County's new procurement system is strongly encouraged and is now required in order to be awarded a bid. At a yet to be determined future date bid announcements will only be made by the new system. In order to register in the new procurement system please go to the following web page (note: it is necessary to submit a W-9 with your registration):
  www.frederickcountymd.gov/procurement

NOTICE: CONTRACTORS AND SUBCONTRACTORS, THAT DO NOT REGISTER, WILL NOT RECEIVE NOTIFICATION OF ADDENDA; THEREFORE THE COUNTY ASSUMES NO RESPONSIBILITY FOR THE FAILURE OF NON-REGISTERED ENTITIES TO RECEIVE ADDENDUMS.

No bids will be considered unless accompanied by a certified check, cashier's check, or a treasurer's check drawn on a bank or a bid bond payable to Frederick County, Maryland in the amount of five (5) percent of the total bid price.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; Owner assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below or otherwise required upon the receipt of a request of the County. Requested information shall be submitted within 3 days of receipt of request from the County

A. Construction Contractor's Qualification Statement for Engineered Construction, AGC Document No. 220, within five days of Owner's request.
B. List of Subcontractors.
C. Contractor's most recent annual financial statements, preferably audited, including your latest balance sheet, income statement, cash flows and notes to the financial statements showing the following items:
    - Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);
    - Net Fixed Assets;
    - Other Assets;
    - Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);
    - Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Subsurface and Physical Conditions*

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.

2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.

4.02 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner by owners of such Underground Facilities, including Owner, or others.

4.03 *Hazardous Environmental Condition*

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to all Bidders as part of the Bidding Documents. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect

to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 4.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions;

E. obtain and carefully study (or accept consequences of not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. promptly give the Owner Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by the Owner and Engineer is acceptable to Bidder; and

J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder

has given the Owner and Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by the Owner and Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A MANDATORY pre-Bid conference will be held AT THE TIME AND LOCATION NOTED IN THE INVITATION TO BID. Representatives of the Owner will be present to discuss the Project. The Procurement and Contracting Department will transmit to all prospective Bidders of record such Addenda as the Owner considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to the Owner and Engineer in writing. Interpretations or clarifications considered necessary by the Owner and Engineer in response to such questions will be issued by Addenda mailed, e-mailed, or delivered to all parties recorded by the Owner and Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. The Owner intends to issue the final addenda at least seven (7) days prior to the advertised bid opening. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% percent of Bidder's maximum Bid price and in the form of a certified check or bank money order or a Bid bond (*see EJCDC document No. C-430* on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 120 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, Milestones are to be achieved, and the Work is to be completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or "or-equal" materials and equipment approved by the Owner and Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by the Owner and Engineer as a substitute or "or-equal" unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. The Owner's and Engineer decision of approval or disapproval of a proposed item will be final. If the Owner and Engineer approve any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which the Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

13.02 All blanks on the Bid Form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item, and unit price item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid Form. The official address of the joint venture shall be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.10 The address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 *If identified as Lump Sum on the Bid Form*

A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate. In the comparison of Bids, alternates will be applied in the same order as listed in the Bid form.

14.011 *If identified as Unit Price on the Bid Form*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the following data:

A. Bid Security
B. Bidder Certification of Work Capacity
C. Affidavit of Qualification to Bid
D. Certificate of Compliance with Regulation 1-2-36
E. Affidavit

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title, name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the Issuing Office.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 7 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within 15 days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 - SALES AND USE TAXES

22.01 Owner is not exempt from State or Federal sales and use taxes for materials and equipment to be incorporated in the work.

ARTICLE 23 - RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

ARTICLE 24 - CONTRACTS TO BE ASSIGNED (Not Applicable)

ARTICLE 25 – PARTNERING (Not Applicable)

SECTION 00200 – BID FORM FOR CONSTRUCTION CONTRACTS

ARTICLE 1 - DESCRIPTION

A. The “BID FORM FOR CONSTRUCTION CONTRACTS," EJCDC Document C-410, Version 2002, herein referred to as the BID FORM, as modified, shall govern the bidding. The modified EJCDC C-410 is attached.

END OF SECTION 00200

BID FORM
FOR CONSTRUCTION CONTRACTS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

ACEC
American Council of Engineering Companies

National Society of Professional Engineers
Professional Engineers in Private Practice

ASCE American Society of Civil Engineers

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN COUNCIL OF ENGINEERING COMPANIES

AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America

and the

Construction Specification Institute

Knowledge for Creating and Sustaining the Built Environment

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(703) 684-2882

American Consulting Engineers Council
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723

BID FORM

BID #18-363-CP
MYERSVILLE LIBRARY

TABLE OF ARTICLES

IFB 18-363-CP
MYERSVILLE LIBRARY
BID FORM

NAME OF BIDDER: _____

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Frederick County, Maryland
c/o Diane Fouche, Director of Procurement & Contracting
Procurement and Contracting Department, Frederick County Maryland
Winchester Hall
12 East Church Street
Frederick, Maryland 21701

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 (One Hundred and Twenty) days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous

to the Site (except Underground Facilities) which have been identified in SC-4.02, and (2) reports and drawings of Hazardous Environmental Conditions that have been identified in SC-4.06.

E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

K. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 – FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the prices shown below:

Total Base Bid Price – Myersville Library	*$*_____

Total Contingent Items Price (sum of Unit Price Extensions for Contingent Items per Section 00200A)	*$*_____
Total Contract Price (Sum of Total Base Bid Price and Total Contingent Items Price)	*$*_____

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

The total Contract Sum will be used by the Owner as the basis of determining the lowest bidder.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be final complete within the agreed to time between the Owner and Contractor. After the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Specification Section 1770 Closeout Procedures.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid security (if providing a bid bond use EJCDC C-430 (2002 Edition) bid bond form).

B. Bidder Certification of Work Capacity

C. Affidavit of Qualification to Bid

D. Certificate of Compliance with Regulation 1-2-36

E. Affidavit

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid submitted by:

NAME OF FIRM: _____

ADDRESS: _____

PHONE: _____ FAX: _____

CONTACT NAME: _____ EMAIL: _____

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Date of Qualification to do business in _____ *[State Where Project is Located]* is ____________.

BID NO 18-363-CP
MYERSVILLE LIBRARY

Section 00200A

SCHEDULE OF UNIT CONTIGENT ITEM PRICES

TO ACCOMPANY THE BID OF

_____

(Bidder/Contractor)

UNIT CONTINGENT ITEMS

UCI #	DESCRIPTION	EST QTY	Unit of Measure	$ PER UNIT	TOTAL
1	EARTH EXCAVATION - HAND	5	CY		
2	EARTH EXCAVATION - MACHINE	25	CY		
3	TRENCH EXCAVATION	25	CY		
4	ROCK EXCAVATION IN OPEN CUT	25	CY		
5	TRENCH ROCK EXCAVATION	25	CY		
6	REMOVAL FROM SITE OF UNSUITABLE SOIL	6300	CY		
7	STRUCTURAL FILL FROM OFF-SITE SOURCES	6300	CY		
8	PERMANENT SEEDING, FERTILIZING, & MULCH	100	SY		
9	SOD	100	SY		
10	FURNISHED, SCREENED TOPSOIL	25	CY		
11	LIGHT PAVING SECTION	25	TON		
12	HEAVY PAVING SECTION	25	TON		
13	ASPHALT ADJUSTMENT				
14	REINFORCED CONCRETE PAVING/PAD/SIDEWALK	25	SF		
15	4" PVC CONDUIT	100	LF		
16	HINGED BOLLARDS				
17	PIPE BOLLARDS	1	EA		
18	PAVEMENT MARKINGS (4" WIDE)	100	LF		

BID NO 18-363-CP
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Section 00200A

19	SHA TYPE A CURB/GUTTER	25	LF		
20	2'X2' LAY-IN CEILING TILE WITH GRID	100	SF		
21	RESINOUS FLOORING	100	SF		
22	CARPET TILE	100	SF		
23	BASE MOLDING	25	LF		
24	VINYL WALL COVER	100	SF		
25	FIRE EXTINGUISHER AND CABINET				
26	FIRE SPRINKLER FLEX HEADS				
27	DUPLEX 120V ELECTRICAL OUTLET	5	EA		
28	DUPLEX 120V ELECTRICAL OUTLET, DEDICATED	5	EA		
29	20AMP, 120V LIGHT SWITCH)	5	EA		
30	20AMP, 120V DIMMER SWITCH 20	5	EA		
31	2'X4' FLOURESCENT LIGHT FIXTURE	5	EA		
32	EMERGENCY EXIT LIGHT	5	EA		
33	EMERGENCY EXIT SIGN	5	EA		
34	FIRE ALARM PULL STATION				
35	FIRE ALARM HORN AND STROBE				
36	VOICE/DATA OUTLET WITH CONDUIT & BOX	5	EA		
37	DUCT ACCESS DOOR 12"X12"	1	EA		

SUM OF ESTIMATED UNIT CONTINGENT ITEMS (Sum of total amounts for UCIs #1-12, 14-15, 17-24; 27-33 and 36-37)	$_____

BID NO 18-363-CP
MYERSVILLE LIBRARY

Section 00200A

UNIT PRICE CONTINGENT ITEMS

The Unit Price Contingent Items identified in this Proposal Form are provided in the Contract for use when and as directed by the Project Manager for the incorporation of additional work not specified in the Contract Documents; however, during the course of the work, the Project Manager may direct the incorporation of any or all of the items. The quantities for the Unit Price Contingent Items shown in this Proposal Form are established for the purpose of obtaining a proposal price. The quantities for these Unit Price Contingent Items may be increased or decreased without any adjustment to the unit price proposal, or may be eliminated entirely from the Contract by the Project Manager without negotiation. No claim for additional costs will be considered should any of the Unit Price Contingent Items be increased, decreased, or eliminated. Contingent item unit prices remain binding for the duration of the contract (and renewals, if any).

Payment for Unit Price Contingent Items will be made on the basis of the quantities as actually measured. Each unit price shall include all labor, materials, and incidental costs necessary to complete the work required by the item. The unit prices shall include all direct and indirect costs, overhead and profit, taxes, and insurance. **These Unit Price Contingent Items do not form a portion of the Contractor's Base Proposal, but will be added to the Base Bid to determine the Total Contract Sum.** Write in the unit prices in clear numerals, and make extensions.

UNIT CONTINGENT ITEM DESCRIPTIONS

UCI-1 Earth Excavation – Hand (i.e. test pitting) beyond the lines and grades indicated on the Contract Documents or referenced details, including proper disposal of excess materials, at the direction of the Owner shall be measured by cubic yard actually excavated and properly disposed of, measured by multiplying the area (in square yards) by the depth of excavation (in yards). Payment will be made for actual quantities measured at the unit price cubic yard listed in the Contingent Items Proposal Form.

UCI-2 Earth Excavation – Machine beyond the lines and grades indicated on the Contract Documents or referenced details, including proper disposal of excess materials, at the direction of the Owner shall be measured by cubic yard actually excavated and properly disposed of, measured by multiplying the area (in square yards) by the depth of excavation (in yards). Payment will be made for actual quantities measured at the unit price cubic yard listed in the Contingent Items Proposal Form.

UCI -3 – Trench Excavation for additional pipe, conduit or footing trenching beyond what is indicated on the Contract Documents or referenced details, at the direction of the Owner shall be measured by cubic yard actually excavated and disposed of, measured by multiplying the length of trench (in yards) by the depth of trench (in yards) by the width of trench (in yards). Payment will be made for actual quantities measured at the unit price per cubic yard listed in the Contingent Items Proposal Form.

UCI -4– Rock Excavation in Open Cut for additional excavation of rock beyond what is indicated on the Contract Documents or referenced details, at the direction of the Owner shall be measured by cubic yard

actually excavated. Payment shall be made for actual quantities measured at the unit price per cubic yard listed in the Contingent Items Proposal Form.

UCI -5 – Trench Rock Excavation for additional trenching of rock beyond what is indicated on the Contract Documents or referenced details, at the direction of the Owner shall be measured by cubic yard actually excavated. Payment will be made for actual quantities measured at the unit price per cubic yard listed in the Contingent Items Proposal Form.

UCI -6 – Removal from Site of Unsuitable Soil for the disposal of soil that has no beneficial purpose on site with measurement by cubic yard actually removed. Payment will be made for actual quantities measured at the unit price per cubic yard listed in the Contingent Items Proposal Form.

UCI -7 – Structural Fill from Off-Site Sources for the transportation, placement, and proper compaction structural fill required for footings, foundations, and slabs. Measurement is by cubic yard actually transported to the site and, payment will be made for actual quantities measured at the unit price per cubic yard listed in the Contingent Items Proposal Form.

UCI-8 - Permanent Seeding, Fertilizing and Mulch includes furnishing and applying permanent seed to all general lawn areas and athletic fields, including fertilizer, lime, and mulch. Work shall also include fine grading and maintenance of seeded lawn areas consisting of weeding, mowing, trimming, refertilization, replanting, and other operations as applicable, to provide an adequate stand. These items shall be paid for at the unit price per square yard of Permanent Seed, Fertilizer and Mulch, furnished, applied, and maintained. The unit price shall include the cost of bed preparation, fine grading, and all labor, equipment, materials, and incidentals necessary to complete the work.

UCI-9 - Sod consists of furnishing, installing, and maintaining turfgrass sod around the perimeter of the skinned infields, as shown on the plans, as detailed and specified. This item shall be paid at the unit price bid per square yard of sod furnished, installed, and maintained in accordance with the specifications. The unit price shall include the cost of furnishing and applying soil amendments, bed preparation, maintenance, and all labor, equipment, materials, and incidentals necessary to complete the work.

UCI -10 – Furnished, Screened Topsoil The unit price shall include screening, transportation to and around the site, stockpiling, placing and fine grading, and all labor, equipment, materials, and incidentals necessary to complete the work. Payment shall be made for actual quantities measured at the unit price per cubic yard as listed in the Contingent Items Proposal Form.

UCI -11 – Light Paving Section for furnishing additional light paving to be used at the Owner's direction. The unit price shall include the placement of subgrade, base paving, and finish paving, and all labor, equipment, materials, and incidentals necessary to complete the work. Payment shall be made for actual quantities measured at the unit price per Ton as listed in the Contingent Items Proposal Form.

UCI -12 – Heavy Paving Section for furnishing additional heavy paving to be used at the Owner's direction. The unit price shall include the placement of subgrade, base paving, and finish paving, and all labor,

equipment, materials, and incidentals necessary to complete the work. Payment shall be made for actual quantities measured at the unit price per Ton as listed in the Contingent Items Proposal Form.

UCI -13 – Asphalt Adjustment – This is a reserve to allow for price changes (increases or decreases) in asphalt, to be used at the direction of the Owner and in accordance with MD SHA Std. Spec. 504.04.01.

UCI -14 – Reinforced Concrete Paving/Pad/Sidewalk (4" Thick) including Formwork, Finishing and Reinforcing for construction in addition to the work shown on the Contract Documents, to be used as directed by the Owner. Unit price shall include all required excavation, graded aggregate base, formwork (installation and removal), finishing and reinforcing, and all labor, equipment, materials, and incidentals necessary to complete the work. Payment will be made for actual quantities measured at the unit price per square foot as listed in the Unit Contingent Items Proposal Form.

UCI -15 – 4" PVC Conduit Basic Materials and Methods) for additional conduit beyond what is indicated in the Contract Documents to be used for underground routing of electrical, security, or communications cabling. Unit price shall include trenching, excavation and backfill, furnishing and installing bedding material and pipe, and all labor, equipment, materials, and incidentals necessary to complete the work. Payment will be made for the actual quantities measured at the unit price per linear foot as listed in the Contingent Items Proposal Form.

UCI-16 - Hinged Bollards consists of furnishing and installing additional Hinged Bollards per the detail shown on the plans and as specified. These items shall be paid at the unit contingent price per each Hinged Bollard furnished and installed in locations not already shown on the contract documents. The unit price shall include the cost of shipping, excavation and backfill, concrete for footings, and all labor, equipment, materials, and incidentals necessary to complete the work.

UCI-17 - Pipe Bollards consists of furnishing and installing the pipe Bollards as shown on the plans and as specified. These items shall be paid at the unit contingent price per each pipe Bollard furnished and installed in locations not already shown on the contract documents. The unit price shall include the cost of shipping, excavation and backfill, concrete for footings, and all labor, equipment, materials, and incidentals necessary to complete the work.

UCI-18 - Pavement Markings (4" wide) consists of furnishing and installing permanent pavement markings for entrance road and parking lots, including stop bars, parking stall striping, and pedestrian crosswalks. Unit price shall include all labor, equipment, materials, and incidentals necessary to complete the pavement markings. Payment will be made for the actual quantities measured at the unit price per linear foot as listed in the Contingent Items Proposal Form.

UCI-19 - SHA Standard Type "A" Curb and Gutter consists of constructing curbing, not shown on the construction documents, as directed by the owner. Refer to Specification Section 02741 – Hot-Mix Asphalt Paving, for all requirements. This item shall be paid at the unit contingent price per linear foot of curbing required, furnished and installed. The unit price shall include the cost of forms, excavation, concrete,

backfill, graded aggregate base, joint sealer, all labor, materials, equipment, and incidentals necessary to complete the work.

UCI-20 – 2'x2' Lay-In Ceiling Tile with Grid consists of installing acoustical ceiling tile, not shown on the construction documents, as directed by the owner. This item shall be paid at the unit contingent price per square foot of additional ceiling tile furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-21 – Resinous Flooring consists of installing resinous flooring as directed by the owner. Refer to Specification Section 09705 – Resinous Flooring, for all requirements. This item shall be paid at the unit contingent price per square foot of additional resinous flooring furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-22 – Carpet Tile consists of installing carpet, not shown on the construction documents, and as directed by the owner. This item shall be paid at the unit contingent price per square foot of additional carpet furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-23 – Base Molding consists of installing additional molding, not shown on the construction documents, and as directed by the owner. This item shall be paid at the unit contingent price per lineal foot of additional molding furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-24 – Vinyl Wall Covering (Acrovyn) consists of installing additional wall coverings, not shown on the construction documents, and as directed by the owner. This item shall be paid at the unit contingent price per square foot of additional wall covering furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-25 – Fire Extinguisher and Cabinet consists of installing an additional fire extinguisher, not shown on the construction documents, and as directed by the owner or Fire Marshal. This item shall be paid at the unit contingent price per extinguisher and cabinet furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-26 – Fire Sprinkler Flex Head consists of installing an additional fire automatic sprinklers, not shown on the construction documents, and as directed by the owner or Fire Marshal. This item shall be paid at the unit contingent price per flex head furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-27 – Duplex 120v Electrical Outlet consists of installing an additional duplex outlet not shown on the construction documents but connected to an electrical circuit already shown. The architect will identify the existing circuit that the outlet will be connected. This item shall be paid at the unit contingent price per outlet

furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-28 – Duplex 120v Electrical Outlet on a Dedicated Circuit consists of installing an additional duplex outlet and circuit to a service panel identified by the architect but within 200 feet of the outlet. This item shall be paid at the unit contingent price per outlet on a dedicated circuit furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-29 – 20amp, 120v Light Switch consists of installing an additional light switch not shown on the construction documents but connected to an electrical circuit already shown. The architect will identify the existing circuit that the switch will be connected. This item shall be paid at the unit contingent price per switch furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-30 – 20amp, 120v Dimmer Switch consists of installing an additional dimmer light switch not shown on the construction documents but connected to an electrical circuit already shown. The architect will identify the existing circuit that the outlet will be connected. This item shall be paid at the unit contingent price per switch furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-31 – 2'x4' Fluorescent Light Fixture consists of installing an additional light fixture not shown on the construction documents but connected to an electrical circuit already shown. The architect will identify the existing circuit that the outlet will be connected. This item shall be paid at the unit contingent price per fixture furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-32 – Emergency Exit Light consists of installing an additional light fixture not shown on the construction documents. The light will be similar to the light specified (either battery or electrical circuit) in the contract documents. This item shall be paid at the unit contingent price per light furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-33 – Emergency Exit Sign consists of installing an additional sign fixture not shown on the construction documents. The sign will be identical to the sign specified (not battery powered) in the contract documents. This item shall be paid at the unit contingent price per sign furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-34 – Fire Alarm Pull Station consists of installing an additional pull station not shown on the construction documents. This item shall be paid at the unit contingent price per station furnished and

installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-35 – Fire Alarm Horn and Strobe consists of installing an additional horn/strobe not shown on the construction documents. This item shall be paid at the unit contingent price per horn/strobe furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the additional work.

UCI-36 – Voice and Date Outlet with Conduit and Box consists of installing additional conduit and box required for the Owner to pull the necessary cable and install the outlet. The conduit length will not exceed 100 feet and will connect to the data closet identified by the Owner. This item shall be paid at the unit contingent price per additional outlet identified to be furnished and installed by the Owner. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the conduit and box installation.

UCI-37 – Duct Access Door, 12”x12” consists of installing an additional duct access door not shown on the construction document. This item shall be paid at the unit contingent price per door furnished and installed. The unit price shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the work.

END OF UNIT CONTINGENT ITEMS

BID FORM ATTACHMENTS

BIDDER CERTIFICATION OF WORK CAPACITY
AFFIDAVIT OF QUALIFICATION TO BID
CERTIFICATION OF COMPLIANCE
AFFIDAVIT

BIDDER CERTIFICATION OF WORK CAPACITY

This certifies that the undersigned guarantees all of the work performed under this Contract to be done in accordance with the Specifications and Special Provisions in a good workmanlike manner and to renew or repair any work which may be rejected due to defective workmanship or materials, prior to final completion and acceptance of the work. Also, we have the equipment, labor supervision, and financial capacity to perform this Contract either with our organization or with subcontractors.

BIDDER: _____

BY: _____
SIGNATURE

TITLE: _____

Sworn to before me this _____ day of _____, 20____

My commission expires _____.

_____
NOTARY PUBLIC

AFFIDAVIT OF QUALIFICATION TO BID

I hereby affirm that:

1. I am the_____ and duly authorized representative
   TITLE
   of the firm _____
   NAME OF CORPORATION
   of whose address is _____
   and that I possess the legal authority to make this affidavit on behalf of myself and the firm for which I am acting.

2. Except as described in Paragraph 3 below, neither I nor the above firm, nor to the best of my knowledge, any of its officers, directors, or partners, or any of its employees directly involved in obtaining Contracts with the State, any unit of the State, or any local governmental entity in the State (including a county, bi-county, or multi-county governmental entity) have been convicted of, or have pleaded nolo contendere to, a charge or have during the course of an official investigation or other proceeding admitted, in writing or under oath, acts or omissions which constitute bribery, attempted bribery, or conspiracy to bribe under the provisions of Article 27 of the Annotated Code of Maryland or under the laws of any State or the Federal Government. (Conduct prior to July 1, 1977 is not required to be reported).

3. _____
   (State "None" or, as appropriate, list any conviction, plea, or admission described in Paragraph 2 above, with the date; court, official or administrative body, the individuals involved and their position with the firm; and the sentence of disposition, if any.)

I acknowledge that this affidavit is to be furnished to the Owner and, where appropriate, to the Board of Public Works and the Attorney General under Maryland State Finance and Procurement Code Annotated, Sections 16-2001 through 16-208. I acknowledge that, if the representations set forth in this affidavit are not true and correct, the Owner may terminate any Contract awarded and take any other appropriate action. I further acknowledge that I am executing this affidavit in compliance with Maryland State Finance and Procurement Code Annotated, Sections 16-201 through 16-208, which provides that certain persons who have been convicted or have admitted to bribery, attempted bribery, or conspiracy to bribe, may be disqualified, either by operation of law or after a hearing, from entering into Contracts with the State or any of its agencies or subdivisions.

I do solemnly declare and affirm under the penalties of perjury and upon personal knowledge that the contents of this affidavit are true and correct.

BIDDER: _____

By: _____
SIGNATURE

Title: _____

Sworn to before me this _____ day of _____, 20____

My commission expires _____.

_____

NOTARY PUBLIC

CERTIFICATION OF COMPLIANCE

With Frederick County Purchasing Regulation 1-2-36, Hiring of Illegal Aliens Prohibited for Performance of County Work

I, _____, hereby certify or attest that:
(Name)

I am the owner or authorized representative of _____;
(Name of Firm)

1. In compliance with Frederick County Purchasing Regulation 1-2-36, and as a contractual requirement of doing business with Frederick County Government, my firm and all of my firm's subcontractors shall only employ individuals legally authorized to work within the United States of America and within Frederick County, Maryland in the performance of work under this contract.;

2. Compliance with Frederick County Purchasing Regulation 1-2-36 is a material contractual obligation and that breach of this obligation could result in contract termination in addition to, and not in lieu of, any and all other remedies available to Frederick County Government and any and all other damages for which my firm might be liable; and

3. Nothing within Frederick County Purchasing Regulation requires Frederick County Government to elect to terminate a contract for default to the exclusion of any other remedy.

By my signature below, I swear or affirm under penalties of perjury that the contents of this Certification of Compliance are true to the best of my knowledge, information and belief.

_____ _____
(Signature) (Date)

Print Name of Signatory: _____

Print Title of Signatory: _____

Employer Name: _____

Employer Address: _____

_____

ATTACHMENT – AFFIDAVIT

(Must be completed and signed BY AN AUTHORIZED SIGNATORY, and submitted with the proposal.)

Contractor: _____

Address: _____

Telephone: _____ Proposal No.: _____

I, _____, the undersigned, _____ of the above name Contractor
Print Signer's Name Print Office Held

do declare and affirm this _____ day of _____, _____ that I hold the aforementioned office in the above named Contractor
Month Year

and I affirm the following:

AFFIDAVIT I: The Contractor, Agent and/or employees, have not in any way colluded with anyone for and on behalf of the Contractor or themselves, to obtain information that would give the Contractor an unfair advantage over others, nor have they colluded with anyone for and on behalf of the Contractor, or themselves, to gain any favoritism in the award of the contract herein.

AFFIDAVIT II: No officer or employee of Frederick County, whether elected or appointed, has in any manner whatsoever, any interest in or has received prior hereto or will receive subsequent hereto any benefit, monetary or material, or consideration from the profits or emoluments of this contract, job, work or service for the County, and that no officer or employee has accepted or received or will receive in the future a service or thing of value, directly or indirectly, upon more favorable terms than those granted to the public generally, nor has any such officer or employee of the County received or will receive, directly or indirectly, any part of any fee, commission or other compensation paid or payable to the County in connection with this contract, job, work, or service for the County, excepting, however, the receipt of dividends on corporation stock.

AFFIDAVIT III: Neither I, nor the Contractor, nor any officer, director, or partners, or any of its employees who are directly involved in obtaining contracts with Frederick County have been convicted of bribery, attempted bribery, or conspiracy to bribe under the laws of any state, or of the federal government for acts of omissions committed after July 1, 1977.

AFFIDAVIT IV: Neither I, nor the Contractor, nor any of our agents, partners, or employees who are directly involved in obtaining contracts with Frederick County have been convicted within the past 12 months of discrimination against any employee or applicant for employment, nor have we engaged in unlawful employment practices as set forth in Section 16 of Article 49B of the Annotated Code of Maryland or, of Sections 712 and 704 of Title VII of the Civil Rights Act of 1964.

AFFIDAVIT V: Neither I, nor the Contractor, nor any of our officers, directors, trustees or partners who are directly involved in obtaining contracts with Frederick County is a member of the County Council or the County Executive for Frederick County, Maryland, nor are we qualified relatives (spouse, parent, child) of said elected officials, nor are we a business entity in which a qualified relative of said elected officials has a direct financial interest.

AFFIDAVIT VI: The Contractor, Agent and/or employees working on its behalf, declare that they, in accordance with the Maryland Campaign Finance Reform Act of 2013, have not provided any campaign financing greater than $200,000, OR having done so, they have filed the appropriate campaign finance-related disclosures with the State Board of Elections and that a copy of the certification is attached to their submission in response to this solicitation. Should the Contractor fail to provide the necessary documentation, the County will notify the State. The necessary documentation may be located: http://www.elections.state.md.us/campaign_finance/disclosure_of_contributions.html

I do solemnly declare and affirm under the penalties of perjury that the contents of the foregoing affidavits are true and correct to the best of my knowledge, information and belief.

DATE: _____ _____
SIGNATURE OF SIGNATORY

EMAIL: _____ _____
PRINTED NAME OF SIGNATORY

SECTION 00300 – STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT, FUNDING AGENCY EDITION

ARTICLE 1 - DESCRIPTION

A. The "STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT, FUNDING AGENCY EDITION" EJCDC Document C-710, Version 2002, herein referred to as the "General Conditions" shall govern the bidding. The **unmodified** EJCDC C-710 is attached.

END OF SECTION 00300

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FUNDING AGENCY EDITION

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

ACEC
American Council of Engineering Companies

National Society of Professional Engineers
Professional Engineers in Private Practice

ASCE American Society of Civil Engineers

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
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AMERICAN COUNCIL OF ENGINEERING COMPANIES
AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America

and the

Construction Specification Institute

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda* – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agency* – The Federal or state agency named as such in the Agreement.

3. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

4. Application for Payment – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

5. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

6. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

7. *Bidder* – The individual or entity who submits a Bid directly to Owner.

8. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).

9. *Bidding Requirements* – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

10. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and Agency and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

11. *Claim* – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

12. *Contract* – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

13. *Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *Contract Price* – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

15. *Contract Times* – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

16. *Contractor* – The individual or entity with whom Owner has entered into the Agreement.

17. *Cost of the Work* – See Paragraph 11.01.A for definition.

18. *Drawings* – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

19. *Effective Date of the Agreement* – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

20. *Engineer* – The individual or entity named as such in the Agreement.

21. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements* – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition* – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste* – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone* – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award* – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

29. *Notice to Proceed* – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

30. *Owner* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

31. *PCBs* – Polychlorinated biphenyls.

32. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

33. *Progress Schedule* – A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

34. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

35. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material* – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Related Entity* – An officer, director, partner, employee, agent, consultant, or subcontractor.

38. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.

39. *Samples* – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

40. *Schedule of Submittals* – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

41. *Schedule of Values* – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

42. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

43. *Site* – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

44. *Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

45. *Subcontractor* – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

46. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

47. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.

48. *Supplementary Conditions* – That part of the Contract Documents which amends or supplements these General Conditions.

49. *Supplier* – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

50. *Underground Facilities* – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

51. Unit Price Work – Work to be paid for on the basis of unit prices.

52. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

53. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and Agency upon recommendation of the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. *Intent of Certain Terms or Adjectives*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered”, “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review**:**

1. a preliminary Progress Schedule;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, Agency, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3) or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for

giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

   a. reviewing and checking all such information and data,

   b. locating all Underground Facilities shown or indicated in the Contract Documents,

   c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

   d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (Contractor shall be responsible for any deductible or self-insured retention.). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition

occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Contractor as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Contractor and made payable to Contractor as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Contractor shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof.

B. Contractor as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Contractor's exercise of this power. If such objection be made, Contractor as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Contractor as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Contractor as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The procedure requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) will perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified , and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume

full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work, Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples*

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

   a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

   b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

   c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

   d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation,

or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and

shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, subject to written approval by Agency at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract

within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

    g. The cost of utilities, fuel, and sanitary facilities at the Site.

    h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressages, and similar petty cash items in connection with the Work.

    i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the

Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.B.

1. delays caused by or within the control of Contractor; or

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent

tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

    a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

    b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

    c. the Contractor's performance or furnishing of the Work is inconsistent with funding Agency requirements;

    d. there are other items entitling Owner to a set-off against the amount recommended; or

    e. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Agency, Contractor, and Engineer shall make a prefinal inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner, Agency, and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The remaining balance of any sum included in the final Application for Payment but held by OWNER for Work not fully completed and accepted will become due when the Work is fully completed and accepted.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Owner and Contractor may mutually request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process hall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. 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

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

ARTICLE 18 – FEDERAL REQUIREMENTS

18.01 *Agency Not a Party*

A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

18.02 *Contract Approval*

A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.

B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

18.03 *Conflict of Interest*

A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.

B. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

18.04 *Gratuities*

A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

18.05 *Audit and Access to Records*

A. For all negotiated contracts and negotiated modifications (except those of $10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they

are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

18.07 *Anti-Kickback*

A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

18.08 *Clean Air and Pollution Control Acts*

A. If this Contract exceeds $100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

18.09 *State Energy Policy*

A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

18.10 *Equal Opportunity Requirements*

A. If this Contract exceeds $10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

18.11 *Restrictions on Lobbying*

A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed $100,000 at any tier under a Federal loan that exceeds $150,000 or a Federal grant that exceeds $100,000.

If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

18.12 *Environmental Requirements*

A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:

1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.

2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.

3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).

4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

EXHIBIT GC-A

Certificate of Owner's Attorney

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

_____

Date: _____

FREDERICK COUNTY DIVISION OF PUBLIC WORKS
MYERSVILLE LIBRARY

SECTION 00320

SUPPLEMENTARY CONDITIONS TO THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, FUNDING AGENCY EDITION EJCDC C-710 (2002 EDITION)

General:

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, Funding Agency Edition (No. C-710, 2002 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

When General Condition Paragraphs or Subparagraphs are deleted in their entirety and replaced by referenced Specification Sections, any remaining General Condition cross-references such as "pursuant to", "as provided in", "established in", etc. also direct the Contract Documents to the referenced Specification Section.

Modifications to Article 1: - DEFINITIONS AND TERMINOLOGY

Paragraph 1.01- Defined Terms

Modify to read,

A.2 *Agency* – The County agency named as such in the agreement.

A.4 *Application for Payment* – The form acceptable to the Owner and provided by the Owner which is to be used by the Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

A.10 *Change Order* – A document which is signed by the Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or Contract Times. Change Orders are issued after the Effective Date of the Agreement and on a form acceptable to the Owner and provided by the Owner.

A.20 *Engineer* – The individual or entity named as such in the agreement. The defined term does not imply that the individual or entity is a registered engineer, but rather the design consultant contracted by the Owner to prepare the Contract Documents. The use of the word "Architect" is synonymous with "Engineer".

A.30 *Owner* - Change the text to read, "Frederick County, Maryland or any of their authorized agents or representatives."

A.46 *Substantial Completion* – Remove the words, "in the opinion of the Engineer" and replace with, "in the opinion of the Owner".

Add the Terms,

A.54 *DECM – Department of Engineering & Construction Management.* Acts as the Owner's representative for construction activities related to the Project and the Work and coordinates the Engineer's activities with other Owner agencies.

A.55 *Construction Change Directive (CCD)* – A written statement to the Contractor issued on or after the Effective Date of the Agreement and signed by the Owner and Engineer that orders an addition, deletion, or revision in the Work or responds to differing or unforeseen subsurface or physical conditions. A Construction Change Directive will not change the Contract Price or Contract Times, unless signed by the Contractor, but will be used as evidence that the parties to the Work expect that the change ordered or documented by the Construction Change Directive will be incorporated in a subsequently issued Change Order following the negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times. CCDs will be issued on a form acceptable to the Owner and provided by the Owner. The use of the words "Work Change Directive" is synonymous with "Construction Change Directive".

A.56 Project *Record Documents* – The documents prepared by the Contractor as required by the Contract Documents for use by the Owner for acceptance of the work.

A.57 *Day* – When referred to in the Contract Documents, a Day is defined as a single calendar.

Delete the Terms,

A.53 *Work Change Directive*

Modifications to Article 2: - PRELIMINARY MATTERS

Paragraph 2.02 - Copies of Documents

Delete the paragraph in its entirety and Replace with, "The Owner shall furnish two (2) sets of drawings, specifications, and addenda for use by the Successful Bidder and its Subcontractors and Suppliers."

Paragraph 2.03 – Commencement of Contract Time; Notice to Proceed

Delete the paragraph in its entirety and Replace with, "The Contract Time will commence to run upon the date mutually agreed to by the Owner and Successful Bidder. The Notice to Proceed will be established at the Pre-Construction Conference."

Paragraph 2.05 – Before Starting Construction

Delete the paragraph in its entirety. Schedule requirements are identified in Specification Section 01320.

Paragraph 2.06.A – Preconstruction Conference

Replace "in Paragraph 2.05.A" with "in specification section 01320".

Paragraph 2.07 – Initial Acceptance of Schedules

Delete the paragraph in its entirety. Schedule requirements are identified in Specification Section 01320

Modifications to Article 3: - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Paragraph 3.01.D - Intent

Add the following subparagraph:

The Contractor shall abide by and comply with the true intent of the Contract Documents and shall not take advantage of any unintentional error or omission, but shall fully complete every part as the true intent and meaning of the Work as described in the Contract Documents.

SubParagraph 3.03.B.2 – Resolving Discrepancies

Add the following subparagraph:

2. The Contract Document shall be given precedence in the following order in resolving errors, discrepancies, or ambiguities:
    a. CCD's (Construction Change Directives)
    b. Change Orders
    c. Addenda
    d. Supplementary General Conditions
    e. General Conditions
    f. Specifications
    g. Drawings and Details
    h. Written dimensions on plans shall govern over scaled dimensions.
    i. Information shown in schedules shall govern over information shown on plans and details.

Modifications to Article 4: - AVAILABILTY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

SubParagraph 4.01.B – Availability of Lands

Delete the subparagraph in its entirety.

SubParagraph 4.01.C – Availability of Lands

Delete the subparagraph in its entirety.

Modifications to Article 5: - BONDS AND INSURANCE

Paragraph 5.02 – Licensed Sureties and Insurers

Delete the words, "the jurisdiction in which the Project is located" and Replace with, "the State of Maryland"

Paragraph 5.03 – Certificates of Insurance

Add the following as Subparagraph 5.03.C,

GENERAL CONTRACTS (GL, AUTO & WC WAIVER OF SUBROGATION)

INSURANCE REQUIREMENTS

Work shall not commence for Frederick County, Maryland until evidence of all required coverage is approved by the Risk Management Department.

COMMERCIAL GENERAL LIABILITY coverage with minimum limits of:
$5,000,000 per Occurrence; $5,000,000 General Aggregate
$5,000,000 Products/Completed Operations Aggregate

Frederick County, Maryland must be added as an Additional Insured. Additional insured status must include Completed Operations.

Policy must not exclude Underground/Explosion/Collapse coverage.

AUTO LIABILITY coverage with minimum limits of:
$1,000,000 Combined Single Limit or $1,000,000 each Person
$1,000,000 each Accident, $1,000,000 Property Damage

Frederick County, Maryland must be listed as an additional insured.

WORKERS' COMPENSATION coverage with minimum statutory limits

Employers Liability coverage with minimum limits of $100,000 per Accident, $100,000 per Employee; and $500,000 per Policy
NOTE: *Out of State employers must show evidence of coverage in Maryland.*

If applicable, **RIGGERS LIABILITY** coverage with minimum limits of:

$1,000,000 per Occurrence and $2,000,000 Aggregate

Frederick County, Maryland must be added as an Additional Insured.

Coverage may be supplied by sub-contractor and must have both the General Contractor and Frederick County, Maryland added as additional insureds.

BUILDERS RISK with "All Risk" coverage with 100% of materials associated with the job.

PLEASE NOTE THE FOLLOWING:

1. **A certificate of insurance showing these coverages must be provided to Frederick County risk Management. The Certificate Holder must be:**

   Frederick County, Maryland
   c/o Risk Management
   12 East Church Street
   Frederick, MD 21701

2. In addition to the certificate of insurance showing additional insured status for the County, the General Liability endorsement must be provided upon request.
3. If any primary policy's limits fall short of the stated requirements, a certificate shall be provided for all any excess policies that supplement or extend these limits.
4. Required insurance is primary and non-contributory, which should be stated on the certificate of insurance.
5. Required insurance must be maintained for the duration of the contract or business relationship.
6. If applicable, the Contractor shall assure that all subcontractors and independent contractors performing services for the County carry identical insurance coverage as required of the contract, either individually or as an Additional Insured on the policies of the Contractor. Exceptions may be made only with the approval of the County.
7. Contractor shall indemnify Frederick County, Maryland for any uninsured losses relating to contractual services involving subcontractors, including workers' compensation claims and the cost of defense.
8. The Contractor shall not commence work for Frederick County, Maryland until evidence of all required coverage is approved by the Risk Management Department.
9. Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.
10. The Contractor will not hold Frederick County, Maryland liable for any injuries to the employees, servants, agents, subcontractors or assignees of the contract arising out of or during the course of services relating to this agreement.
11. The providing of any insurance required herein does not relieve the Contractor of any of the responsibilities or obligations assumed by the Contractor in the contract awarded or for which the Contractor may be liable by law or otherwise. Approval of the insurance by the County shall not in any way relieve or decrease the liability of the Contractor.
12. All of the above coverages must be written by a carrier with a minimum A.M. Best rating of A- or better AND a financial size classification of VI or higher. All insurance policies must also be underwritten by companies licensed to do business in the State of Maryland and all certificates must include an authorized signature.

Paragraph 5.03 – Certificates of Insurance

Add the following as Subparagraph 5.03.D,

If any of these policies are written on a "claims made" form, the "extended reporting endorsement" or "tail" must be purchased with a copy of the endorsement provided to the Owner or coverage must be maintained for three (3) years.

Liability insurance may be arranged by Commercial General Liability and Comprehensive Automobile Liability policies for the full limits required, or by a combination of

underlying Liability policies for lesser limits with the remaining limits provided by an Excess or Umbrella Liability Policy.

Paragraph 5.04 – Contractor's Liability Insurance
Replace the following text in Subparagraph 5.04.B.7,
"in effect for at least two years" with "in effect for at least three years"

Paragraph 5.04 – Contractor's Liability Insurance
Replace the following text in Subparagraph 5.04.B.7.a,
"at final payment and one year thereafter." with "at final payment and three years thereafter."

Modifications to Article 6: - CONTRACTOR'S RESPONSIBILITIES
Paragraph 6.01 – Supervision and Superintendence
Add the following as Subparagraph 6.01.C,
At any time during the performance of the work or services of the Contract, Owner may request the replacement of any member of Contractor's personnel. Upon receipt of such request, Contractor shall assign a competent, suitably qualified replacement acceptable to the Owner. Owner may also request replacement of any member of any sub-contractor's personnel, and Contractor shall ensure assignment of a competent, suitably qualified replacement.

Paragraph 6.02.B – Labor; Working Hours
Replace the word "Engineer" with "Owner".

Paragraph 6.02.C - Labor; Working Hours
Add the following as Subparagraph 6.02.C,

C. The Contractor will develop the construction schedule based on the following:

8 Harp Place Myersville, MD 21773: 7-days per week including weekends and holidays

- Monday through Friday: begins no earlier than 7:00am EST and ends no later than 4:00 pm EST.
- Saturday, Sunday, and Holidays: To be determined between contractor and Frederick County.

The working hours may be adjusted if requested by the Contractor and approved DECM.

Work stoppages may occur throughout the duration of the project. In the event of a work stoppage(s), Frederick County, Maryland will provide as much advanced notice as possible to the Contractor. In the event of a work stoppage(s), **non-compensatory time** will be added to the duration of the contract based on the length of the stoppage(s).

Paragraph 6.02.D - Labor; Working Hours
Add the following as Subparagraph 6.02.D,

D. The Owner recognizes the following holidays (January 1st, Martin Luther King Day, Memorial Day, July 4th, Labor Day, Veteran's Day, County General Election Day, Thanksgiving, the day after Thanksgiving, December 24th, and December 25th). In the event the named holidays fall on a weekend, the Owner will celebrate the holiday the proceeding day and the Contractor must adjust the construction schedule accordingly. All listed holidays are considered non-work days during the contract duration and must be shown accordingly in the construction schedule. If the Contractor

desires to work on a holiday, a request should be submitted to DECM 48 hours in advance of the holiday. DECM is under no obligation to approve the request.

Paragraph 6.04 – Progress Schedule
Delete the paragraph in its entirety. Schedule requirements are identified in Specification Section 01320.

SubParagraph 6.05.A.2 – Substitutes and "Or-Equals"
Delete the subparagraph in its entirety. Substitution requirements are identified in Specification Section 01630.

SubParagraph 6.05.B – Substitutes and "Or-Equals"
Delete the subparagraph in its entirety. Substitution requirements are identified in Specification Section 01630.

SubParagraph 6.05.C – Substitutes and "Or-Equals"
Delete the subparagraph in its entirety. Substitution requirements are identified in Specification Section 01630.

SubParagraph 6.05.D – Substitutes and "Or-Equals"
Delete the subparagraph in its entirety. Substitution requirements are identified in Specification Section 01630.

SubParagraph 6.05.E – Substitutes and "Or-Equals"
Delete the subparagraph in its entirety. Substitution requirements are identified in Specification Section 01630.

SubParagraph 6.06.B – Concerning Subcontractors, Suppliers, and Others
Delete the paragraph in its entirety and replace with the following:

If the Bidding Documents require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Bidding Documents, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work

Paragraph 6.08 – Permits
Delete the paragraph in its entirety and Replace with,

The Architect shall apply for and secure the building permit for this project. The Contractor shall secure all other governmental permits, approvals, licenses, and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract, and which are legally required at the time the bids are received. The Owner will pay the cost of fees associated with road footage improvements, road permits, water and sewer tap fees and connection charges, cost of water meter, and electric, telephone, and gas company connection charges and the cost of same shall <u>not</u> be included in the Contractor's bid. The Contractor shall be

responsible for coordinating the Work under this Contract with all interested utility companies and inspection agencies. No claim for additional cost or time will be considered as a result of the Contractor's failure to properly coordinate this work.

SubParagraph 6.11.C – Use of Site and Other Areas
In addition to the requirements outlined in the General Conditions, the Contractor is also required to:

.1 thoroughly clean interior building areas when ready to receive finish painting and continue cleaning on an as-needed basis until building is ready for acceptance or occupancy;
.2 schedule cleaning operations so that dust and other contaminants resulting from cleaning process do not fall on wet, newly-painted surfaces;
.3 allow no waste materials, rubbish, and debris to accumulate and become unsightly, hazardous, or impair the progress of the Work;
.4 clean all glass and aluminum surfaces;
.5 repair, patch, and touch-up marred surfaces to match adjacent finishes;
.6 remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior surfaces of fixtures, hardware, and equipment furnished as a part of this Contract;
.7 use only materials and methods for cleaning finish surfaces approved by manufacturers;
.8 clean up all work areas on a daily basis; and
.9 shall be responsible for procuring permits and paying all fees for the hauling and dumping of rubbish, waste materials, and debris from the site to area approved by local authorities.

Paragraph 6.14 – Safety Representative
In addition to the requirements outlined in the General Conditions, the Contractor is also required to enforce:

Hard hats will be required at all construction sites included under this Contract from the start to completion of the Work. Each subcontractor, employee, and visitor at any construction site included under this Contract will be required to wear a hard hat. The Contractor shall provide for the supply and shall enforce the wearing of hard hats by subcontractors, employees, and visitors.

Paragraph 6.17 – Shop Drawings and Samples
Delete the paragraph in its entirety. Shop Drawings requirements are identified in Specification Section 01330.

Paragraph 6.18 – Continuing the Work
Delete "except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing."

<u>Modifications to Article 7:</u> - OTHER WORK AT THE SITE
SubParagraph 7.01.A.2 – Related Work at Site
Delete the subparagraph in its entirety.

<u>Modifications to Article 8:</u> - OWNER'S RESPONSIBILITIES
Paragraph 8.01.A – Communications to Contractor
Change the words, "through Engineer." to "through DECM."

Paragraph 8.02 – Replacement of Engineer
Delete the paragraph in its entirety.

Paragraph 8.04 – Pay When Due

Delete the paragraph in its entirety. Payments to the Contractor will be in accordance with specification section 01200.

Modifications to Article 9: - ENGINEER'S STATUS DURING CONSTRUCTION
SubParagraph 9.06.A – Shop Drawings, Change Orders, and Payments
Delete the subparagraph in its entirety. Shop Drawings requirements are identified in Specification Section 01330.

SubParagraph 9.06.D – Shop Drawings, Change Orders, and Payments
Delete the subparagraph in its entirety. Shop Drawings requirements are identified in Specification Section 01330.

Paragraph 9.07 – Determinations for Unit Price Work
Delete the paragraph in its entirety.

SubParagraph 9.08.C – Decisions on Requirements of Contract Documents and Acceptability of Work
Delete the subparagraph in its entirety.

Modifications to Article 10: - CHANGES IN THE WORK; CLAIMS
Paragraph 10.05 – Claims
Substitute "Owner" for all instances where "Engineer" is listed throughout paragraph.

Paragraph 10.05.G – Claims
Add the following subparagraph;
Decision of the Owner: Claims, including those alleging an error of omission by the Engineer, shall be referred initially to the Engineer for action as provided in Article 10. A final decision by the Owner, as provided in Subparagraph 10.05.E of these Supplementary Conditions, shall be required as a condition precedent to arbitration or litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of whether such matters relate to execution and progress of the Work or the extent to which the Work has been completed.

Paragraph 10.06 – Arbitration
Add the following text;

> If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by either the Owner or Architect, the Owner will render a final decision in writing within thirty (30) days relative to the Claim, including any change in the Contract Sum or Contract Time or both, which decision shall be final and binding on the Contractor, but subject to Arbitration. The Owner reserves the right to notify the surety of the nature and amount of the Claim and may request the surety's assistance in resolving the controversy.

A. In the event of a dispute between the parties to this contract involving $10,000.00 or more regarding the terms of the contract or performance under the contract, the question involved in the dispute shall be subject to a determination of questions of fact by an officer or official body of the County selected by the Chief Administrative Officer, in his/her sole discretion, who may include but is not limited to any of the Directors of Frederick County Government's Divisions of Public Works, Utilities and Solid Waste Management or Finance. The decisions of the officer or official body selected by the County Chief Administrative Officer to resolve this dispute are subject to review on the record by the Circuit Court of Frederick County.

B. A dispute between the parties to this contract involving less than $10,000.00 regarding the terms of the contract or performance under the contract shall be determined by an officer or official body of the County selected by the Chief Administrative Officer, in his/her sole discretion, who may include but is not limited to any of the Directors of Frederick County Government's Divisions of Public Works, Utilities and Solid Waste Management or Finance. The decision of the officer or official body selected by the County Chief Administrative Officer to resolve this dispute shall be final and binding on the parties to the dispute, and conclusive of the issue.

C. The only parties to any proceeding to determine a dispute shall be the contractor and the owner, unless the contractor and owner otherwise agree to allow additional parties.

D. Before submitting a request for determination of a dispute under this section, a party must first request a resolution of the issue by the DECM. DECM shall issue a final written response to the request. If the party is unable to satisfactorily resolve the dispute with DECM and desires a determination of the dispute under this section, a notice of a request for the determination of a dispute shall be sent in writing to the other party to this agreement and to the Chief Administrative Officer, and a copy sent to the consultant.

E. A request for a determination of a dispute must be filed with the Chief Administrative Officer within 60 days of the determination by the DECM.

F. Unless otherwise agreed, the contractor shall carry on the work and maintain its progress during any dispute proceedings as if no dispute had occurred, and the owner shall continue to make payments to the contractor in accordance with the contract documents for items not subject to the dispute.

G. Under this Contract, it is agreed that the only parties to a dispute shall be the Contractor and the Owner, unless the Contractor and Owner otherwise agree to allow additional parties.

H. Within sixty (60) days of receipt of the Owner's decision on a claim or dispute pursuant to the procedures set forth in the Contract Documents, a notice of a request for the determination of a claim or dispute shall be sent in writing to the Director, Frederick County Division of Public Works, with a copy sent to the County Attorney.

I. Unless otherwise agreed, the Contractor shall carry on the Work and maintain progress of the Work during any dispute proceedings and the Owner shall continue to make payments to the Contractor in accordance with the Contract Documents.

<u>Modifications to Article 11:</u> - COST OF THE WORK; ALLOWANCES; UNIT (CONTINGENT ITEM) PRICE WORK

SubParagraph 11.01.A.5.i – Cost of the Work

Rename this paragraph 11.01.B.6. These services are excluded from the Cost of Work.

SubParagraph 11.02.A – Allowances

Delete the words, "and Engineer.".

SubParagraph 11.02.D – Allowances

Delete the words, "by Engineer.".

SubParagraph 11.03.B – Unit Price Work

Delete the sentence, "Determinations of the actual quantities... provisions of Paragraph 9.07.".

SubParagraph 11.03.D – Unit Price Work

Delete the subparagraph in its entirety.

<u>Modifications to Article 12:</u> - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

SubParagraph 12.01.A – Change of Contract Price

Change the words "to the Engineer" to "to the Owner".

SubParagraph 12.01.C – Contractor's Fee

Delete the text in its entirety and Replace with;

1. Overhead and profit used in determining adjustments to the Contract Sum shall be calculated as follows:

a. The allowable mark-up for combined overhead and profit for Work performed by the General Contractor with their own forces shall not exceed fifteen percent (15%) based upon the monetary value of the Work. For Work performed by a Subcontractor with their own forces, the percentages for combined overhead and profit for a Subcontractor will be as stated above.

b. On Work partly or solely performed by a Subcontractor, the General Contractor will be allowed a maximum of eight percent (8%) of the total cost of the Subcontractor's labor and material costs only.

c. Overhead and profit rates stated above shall include the cost for additional bond and insurance coverage and cost for preparation and procurement of cost proposals and change orders.

d. All cost proposals shall include a complete breakdown of material and labor costs showing the material list, unit prices, hours, and applicable pay rates.

SubParagraph 12.02.A – Change of Contract Times

Delete the subparagraph in its entirety and Replace with;

The Contract Times may only be changed by a Change Order.

SubParagraph 12.03.C – Delays

Remove the entire Paragraph and replace with;

C. Weather Delays - Extensions of time, when granted, will be based upon the effect of delays to the Work as a whole. The time extensions due to weather delays will be non-compensable to either party of the contract. Extensions of time will not be granted for non-controlling delays to minor included portions of work unless it can be shown that such delays did, in fact, delay the progress of the Work as a whole. Extensions of time will not be granted until such time as the County is satisfied they are appropriate and justified. Unusually severe weather must be more severe than the inclement weather anticipated for the project location during any given month. The following schedule of monthly anticipated inclement weather delays will constitute the baseline for monthly weather time evaluation. The Contractor's progress schedule must reflect these anticipated inclement weather delays in all weather dependent activities. If the anticipated inclement weather days are not realized for any particular month, the Owner may execute a change order to remove the scheduled calendar days from the schedule on a non-compensable basis.

Monthly anticipated inclement calendar weather days schedule:

January – 7
February – 7
March – 8
April – 8
May – 8
June – 6
July – 6
August – 6
September – 6
October – 5
November – 6
December – 6.

If inclement weather affects the projects Critical Path, the Contractor shall complete a Weather Delay Request Form supplied by DECM and submit the request to DECM on the day the inclement

weather event occurred. The form shall include the type of inclement weather, the CPM activities affected by the weather, if the listed activities are on the Critical Path, and the specific work, which could not be performed. DECM must either concur or deny within 72 hours of receiving the weather delay request. No time extension for inclement weather will be granted until the number of accepted weather delay requests exceeds the anticipated average inclement weather days per month specified in subparagraph 12.03.C.1.a. Weather delays will be evaluated on a monthly basis. If the Weather Delay Request Form is not submitted within 48 hours of the inclement weather day, the contractor waives his right to a time extension.

Modifications to Article 13: - TEST AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCEOF DEFECTIVE WORK

Sub Paragraph 13.03.D – Tests and Inspections

Delete the subparagraph in its entirety.

SubParagraph 13.07.A – Correction Period

In the first sentence, Replace “within one year” with “within two years”.

SubParagraph 13.07.D – Correction Period

Replace “an additional period of one year” with “an additional period of two years”.

Modifications to Article 14: - PAYMENTS TO CONTRACTOR AND COMPLETION

SubParagraph 14.01.A – Schedule of Values

Replace “Engineer” with “Owner”.

Paragraph 14.02 – Progress Payments

Delete paragraph in its entirety. Payment requirements are identified in Specification Section 01200.

Paragraph 14.04 – Substantial Completion

Delete paragraph in its entirety. Schedule requirements are identified in Specification Section 01770.

Paragraph 14.05 – Partial Utilization Substantial Completion

Delete paragraph in its entirety.

Paragraph 14.06 – Final Inspection

Delete paragraph in its entirety. Schedule requirements are identified in Specification Section 01770.

Paragraph 14.07 – Final Payment

Delete paragraph in its entirety. Schedule requirements are identified in Specification Section 01770.

Paragraph 14.08 – Final Completion Delayed

Delete paragraph in its entirety.

Modifications to Article 15: - SUSPENSION OF WORK AND TERMINATION

Paragraph 15.02.C– Owner May Terminate for Cause

Delete the words “reviewed by the Engineer as to their reasonableness and, when so approved by the Engineer,”.

Paragraph 15.04 – Contractor May Stop Work or Terminate
Delete paragraph in its entirety.

Modifications to Article 16: - DISPUTE RESOLUTION
Article 16 - Delete Section in its entirety. Refer to Paragraph 10.06 Arbitration

Modifications to Article 17: - MISCELLANEOUS
Paragraph 17.052– Computation of Times
Revise "by the law of the applicable jurisdiction" to "by the law of the State of Maryland in Frederick County".

Paragraph 17.05 – Controlling Law
Revise to reflect the Contract is governed by the law of the State of Maryland in Frederick County.

Modifications to Article 18: - FEDERAL REQUIREMENTS
Delete the Article in its entirety.

Modifications to EXHIBIT GC-A: - Certificate of Owner's Attorney
Delete the Exhibit in its entirety.

SECTION 00400 – CONTRACT FORMS

ARTICLE 1 - GENERAL

A. The following forms, as listed or set forth in this Section and as described elsewhere in these documents, shall be used as a basis for all required documents. They shall be completed in detail as they apply for the duration of the Contract, shall be prepared by the Contractor in accordance with the particular requirements of this Contract, and shall be submitted to and approved by the Engineer except where otherwise specifically noted in these documents.

ARTICLE 2 - STANDARD EJCDC or AIA FORMS

A. The latest edition of the following standard forms, as printed and distributed by the Engineers Joint Council Documents Committee (EJCDC) or the American Institute of Architects (AIA).

1. Bid Bond (EJCDC C-430, 2002 Version)
2. Performance Bond (EJCDC C-610, 2002 Version)
3. Payment Bond (EJCDC C-615)
4. Form of Agreement (EJCDCC-521, 2002 Version)
5. Application and Certificate for Payment (AIA G702, 1997 Version) and Continuation Sheet (AIA G703)
6. Certificate of Substantial Completion (EJCDC C625 or AIA G704)
7. Change Order (EJCDC C-941) or form approved and provided by Owner
8. Contractor's Affidavit of Payment of Debts and Claims (AIA G706) or form approved and provided by Owner
9. Contractor's Affidavit of Release of Liens (AIA G706A) or form approved and provided by Owner
10. Consent of Surety to Final Payment (AIA G707) or form approved and provided by Owner
11. Consent of Surety Company to Reduction In or Partial Release of Retainage (AIA G707A) or form approved and provided by Owner
12. Construction Change Directive (AIA G714) or Work Change Directive (EJCDC C-940)
13. Notice of Award
14. Notice to Proceed

END OF SECTION 00400

FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR FOR
CONSTRUCTION CONTRACT (STIPULATED PRICE)
FUNDING AGENCY EDITION

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

ACEC
American Council of Engineering Companies

National Society of Professional Engineers
Professional Engineers in Private Practice

ASCE American Society of Civil Engineers

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
AMERICAN COUNCIL OF ENGINEERING COMPANIES
AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America

and the

Construction Specification Institute

Knowledge for Creating and Sustaining the Built Environment

This document has been accepted by
United States Department of Agriculture
Rural Utilities Service, Water and Waste Programs

1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882

American Council of Consulting Engineers
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723

AGREEMENT 18-363-CP
MYERSVILLE LIBRARY

THIS AGREEMENT is by and between Frederick County, Maryland ("Owner") and

("Contractor").

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The work under this contract includes but is not limited to the renovation and fit-out of the third floor executive suite as required per the contract documents.

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

MYERSVILLE LIBRARY
8 Harp Place Myersville, MD 21773

ARTICLE 3 – ENGINEER

3.01 The Project specifications have been written by Noelker and Hull (N&H) who will act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days to Complete the Work Identified by the Contract Documents and Obtain Final Payment*

A. The "Work" will be completed within three hundred and five (305) calendar days defined in the Invitation for Bid after the date when the Contract Times commence per the Notice to Proceed, and completed and ready for final payment in accordance with Section 1770 Closeout Procedures.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration preceding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $1,00.00 (One Thousand Dollars) for each calendar day that expires after the time specified in Paragraph 4.02 for Completion of the "Work" until the "Work" is complete and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A.

Total Base Bid Price – Myersville Library	*$*_____
Total Contingent Items Price (sum of Unit Price Extensions for Contingent Items # 1-37	*$*_____
Total Contract Price (Sum of Total Base Bid Price and Total Contingent Items Price)	*$*_____

All specific items are included in the above price and have been computed in accordance with paragraph 11.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the First day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in paragraph 2.07A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with paragraph 14.02 of the General Conditions:

   a. 95 percent of Work completed (with the balance being retainage); and

   b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. In addition to retainage, Owner may withhold from payments otherwise due Contractor any amount that Owner reasonably believes necessary to protect Owner's interest.

6.03 *Final Payment*

A. Upon receipt of the final Application for Payment accompanied by Engineer's recommendation of payment in accordance with paragraph 14.07 of the General Conditions, Owner shall pay Contractor as provided in paragraph 14.07 of the General Conditions the remainder of the Contract Price as recommended by Engineer as provided in said paragraph 14.07 of the General Conditions, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear no (0%) interest.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions.

E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

1. This Agreement (pages 1 to 6, inclusive)
2. Invitation for Bids (pages _____to _____, inclusive)
3. Instructions to Bidders (pages _____to _____, inclusive)
4. General Conditions (pages _____to _____, inclusive)
5. Supplementary Conditions (pages _____ to _____, inclusive)
6. Specifications as listed in the table of contents of the Project Manual
7. Drawings consisting of _____ sheets with each sheet bearing the following general title: _____.
8. Addenda (numbers _____to _____, inclusive)
9. Exhibits to this Agreement (enumerated as follows)
    a. Contractor's Bid
        1) pages _____ to _____, inclusive)
        2) Non-Collusion Affidavit of Prime Bidder and Non-Collusion Certification
        3) Certificate of Compliance with Regulation 1-2-36
        4) List of Subcontractors
        5) Pages _____ to _____, inclusive
        6) Bidder Certification of Work Capacity
        7) Affidavit of Qualification to Bid
10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Order(s).
11. There are no Contract Documents other than those listed above in this Article 9.
12. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in two copies. One counterpart each has been delivered to Owner and to Contractor. All portions of the Contract Documents have been identified by Owner and Contractor or identified by Engineer on their behalf.

This Agreement is dated _____. .

CONTRACTOR:

By: _____

Title: _____

[CORPORATE SEAL]

Attest: _____

Title: _____

Address for giving notices:

_____

_____

_____

_____

_____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

FREDERICK COUNTY, MARYLAND:

Jan H. Gardner
County Executive
APPROVED VIA INFOR

SECTION 00450 – CONTRACTOR'S QUALIFICATION STATEMENT

ARTICLE 1 - GENERAL

A. The Contractor's Qualifications Statement shall be submitted within three days of Owner's request.

END OF SECTION 00450

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE

Corporation ☐

Partnership ☐

Individual ☐

Joint Venture ☐

Other ☐

NAME OF PROJECT

1. ORGANIZATION

1.1 How many years has your organization been in business as a Contractor?

How many years has your organization been in business under its present business name?

Under what other or former names has your organization operated?

If your organization is a corporation, answer the following:

Date of Incorporation:
State of Incorporation:
President's name:
Vice-President's name(s):

Secretary's name:
Treasurer's name:

If your organization is a partnership, answer the following:

Date of organization:
Type of Partnership (if applicable):
Name(s) of general partner(s):

If your organization is individually owned, answer the following:

Date of Organization:
Name of Owner:

If the form of your organization is other than those listed above, describe it and name the principals:

2. LICENSING

2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business and indicate registration or license numbers, if applicable:

2.2 List jurisdictions in which your organization's partnership or trade name is filed:

3. EXPERIENCE

3.1 List the categories of work that your organization normally performs with its own forces.

3.2 Claims and Suits: (If the answer to any of the questions below is yes, please attach details.)

Has your organization ever failed to complete any work awarded to it?

Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years?

3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.

3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

3.4.1 State total worth of work in progress and under contract:

3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of the project, owner, engineer, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

3.5.1 State average annual amount of construction work performed during the past five years:

3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of our organization.

3.7 List the names of the subcontractors proposed to complete the Asphalt Paving required on this contract.

4. REFERENCES

4.1 Trade References:

4.2 Bank References:

4.3 Surety:

4.3.1 Name of Bonding Company:

4.3.2 Name and address of agent:

5. FINANCING

5.1 Financial Statement

5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

5.1.3 Is the attached financial statement for the identical organization named on page one?

5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

5.2 Will the organization whose financial statement is attached act as a guarantor of the contract for construction?

6. SIGNATURE

6.1 Dated at _____ this _____ day of _____, 20 _____.

Name of Organization:_____

By:_____

Title:_____

6.2 _____, being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this _____ day of _____, 20____.

Notary Public:_____

My Commission Expires:_____

SECTION 00600 – BONDS AND CERTIFICATES

ARTICLE 1 - DESCRIPTION

A. The Bid Bond EJCDC C-430 (Version 2002), herein referred to as the "BID BOND", Performance Bond EJCDC C610 (Version 2002), herein referred to as the "PERFORMANCE BOND" and Payment Bond EJCDC C615 (Version 2002), herein referred to as the "PAYMENT BOND" shall govern the bidding and execution of the Agreement. A sample copy of EJCDC C-430, EJCDC C-610 and EJCDC C-615 are attached.

END OF SECTION 00600

BID BOND
IFB 18-363-CP
MYERSVILLE LIBRARY

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER:
Frederick County, Maryland
12 East Church Street
Fredrick, MD 21701

BID
Bid Due Date:
Project:
IFB 17-363-CP Myersville Library

BOND
Bond Number:
Date (Not later than Bid due date):
Penal sum _____ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Surety's liability.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2. All Bids are rejected by Owner, or

3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PERFORMANCE BOND
IFB 18-363-CP
MYERSVILLE LIBRARY

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER:
Frederick County, Maryland
12 East Church Street
Frederick, MD 21701

CONTRACT
Date:
Amount:
Description:
IFB 17-363-CP Myersville Library
BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form: None

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

EJCDC No. C-610 (2002 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.

3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

3.3. Owner has agreed to pay the Balance of the Contract Price to:

1. Surety in accordance with the terms of the Contract;

2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or

2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

12.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.

12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker
Owner’s Respresentative (engineer or other party)

PAYMENT BOND
IFB 18-363-CP
MYERSVILLE LIBRARY

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):
Frederick County, Maryland
12 East Church Street
Fredrick, MD 21701

CONTRACT
Date:
Amount:
Description: Bid No. 17-363-CP:
Myersville Library

BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form: None

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

EJCDC No. C-615 (2002 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with Contractor:

1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.

6. RESERVED.

7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative (engineer or other party):

SECTION 01100 - SUMMARY

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Use of premises.
4. Owner's occupancy requirements.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The work on this project includes, but not limited to:

The Work of this Project is defined by the Contract Documents and includes but is not limited to the following: The construction of a new 6,900 square foot public library facility. The building use is classified as A3 (Assembly). The construction classification is 2B. The facility will include a slab on grade, brick, cementitious lap-siding and curtain wall clad exterior; steel framing with standing seam metal and a TPO roof. Interior partitions will be metal stud with gypsum wall board. Ceiling will include painted drywall, exposed structure and lay-in acoustical ceiling tiles. Work will also include a complete HVAC system, electrical service, lighting, plumbing, plumbing fixtures, and interior finishes. Site work will include grading, utilities (including gas, water, sanitary, stormwater, and electrical), parking lot paving and striping, site lighting, and landscaping. Utility and earthwork shall be unclassified. A fully functioning, temporary construction trailer shall be fully installed and energized with electricity on the date of the selected notice to proceed. Notice to Proceed is anticipated to be issued July/August 2018.

WATER METER:
The Town of Myersville will supply the 3” water meter to be installed by the contractor. It is the contractor’s full responsibility to install the water meter. The Town will provide their engineer for inspection of the water mater installation.

POTOMAC EDISON POWER:
The site will require a power source which will be installed by Potomac Edison. It shall be the contractor’s responsibility to coordinate with Potomac Edison for power installation. The successful contractor is responsible for installing all conduit necessary for power connections.

SPRINKLER/FA/ALARM:
Frederick County will hire an independent contractor (Simplex Grinnell) to install the sprinkler system, fire alarm system, and intrusion alarm system. Simplex Grinnell will install the sprinkler system beginning after the OS&Y gate valve on the discharge side of the backflow preventer. The successful contractor will be responsible for the installation up to this point. Simplex will purchase and install the tamper switches for the (2) backflow OS&Y gate valves, sprinkler riser pipe, sprinkler riser check valve, man drain, flow switch, gauges, and fire department connection. Specifications regarding these systems are for informational purposes only. The selected contractor shall be responsible for the purchase and installation of the fire extinguishers and associated cabinet. It shall

be the successful contractor's responsibility to coordinate and schedule the installation of these systems with Simplex Grinnell.

HVAC:
Frederick County will be responsible for the purchase and installation of the Mitsubishi equipment and its associated ductwork, refrigerant lines, controls, etc. The contractor will be responsible for the electrical connections to the complete HVAC system, including the portion that Frederick County installs. The contractor will be responsible for the plumbing installation associated with the complete HVAC installation, including the portion that Frederick County installs. The contractor will be responsible for the purchase and installation of all exterior wall penetrations, the outside air intake louver and the exhaust air louvers. The 2nd exhaust air louver is for aesthetic purposes only. The contractor will be responsible for the purchase and installation of all other components of the HVAC system. Specifications regarding the Frederick County installation are for informational purposes only. It shall be the successful contractor's responsibility to coordinate and schedule the installation of these systems with Frederick County's installation crew.

IIT NETWORK:
Frederick County IIT installs their own data network. The contractor is responsible for the installation of the single gang device box and ¾"conduit to accessible ceiling space at data connections. Conduit to turn towards interior of room above ceiling. Low voltage conduit run in the slab shall be 1". Refer to electrical drawings for additional details.

MYERSVILLE HISTORIC TROLLEY:
The Town of Myersville will contract and procure the insertion of history Trolley 150 into the library via a contractor selected by the Town. The Trolley is currently located adjacent to the site and will be ready for insertion into the library near the end of the construction project. The Trolley shall be inserted via window ST-14 as defined by the project documents. The contractor is to provide means to secure the building until window ST-14 is installed. It shall be the contractor's responsibility to coordinate and schedule the installation of Trolley 150, with the Town of Myersville and the Frederick County Project Manager. The contractor is to coordinate the Trolley footing pier locations with the Town of Myersville. Refer to sheet S1.1 for additional details.

It is the contractor's responsibility to obtain all applicable permits. Permits costs of application may be exempt due to ownership of the project.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings or the Contract documents.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a) Schedule deliveries to minimize the use of driveways and entrances.
   b) Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed between 7:00am and 4:00pm, Monday through Friday or as defined in the Contract Documents. Weekend and Holiday work may be

required. Hours for weekends and holidays are to be determined between contractor and Frederick County. Any deviations shall be approved by the County Representative in advance.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect/ Owner not less than seven days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION 01100

SECTION 01200 – PRICE & PAYMENT PROCEDURES

1. GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to 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. If required by the Owner, submit a Schedule of Values within seven (7) calendar days after the construction notice-to-proceed.
   2. An initial Application for Payment will not be accepted until the submitted Schedule of Values has been accepted by the Owner

B. Provide at least five (5) activities including at least one line item for each Specification Section.
   1. Include the following pay items in the Schedule of Values, if required by the Specifications: Testing and Start-up, O&M Manuals, As-built Drawings
   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a) Description of the Work
      b) Dollar value
   3. If progress payments are to be included, provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports.
   4. The total shall equal the Contract Sum.
   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. Allowances, Unit Contingent Items, and Alternates: If included in the contract, provide a separate line item in the Schedule of Values for each Allowance, Unit Contingent Items, and Alternates. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity.
   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.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by 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: The date for each Application for Payment will be agreed to by the Owner and the Contractor prior to the start of work, and at an interval as indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement between Owner and Contractor.

C. Payment Application Forms: The Contractor will use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment. Use of any other application form shall have prior approval from the Owner. *Note: the Owner may be able to prepare the AIA documents for the Contractor execution after progress review and agreement with the Contractor.*

D. Application Preparation: Complete every entry on the form, including Schedule of Value items that have no completed work.

1. Entries shall match data on the Schedule of Values. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by the application.
2. The Contractor's Project Manager and the Owner will agree to partial Payments for schedule of value line items.
3. The Contractor is required to notarize all applications and execute by a person authorized to sign legal documents on behalf of Contractor.
4. In the event that liquidated damages are due based on the completion of the work in relation to the contract duration, the Owner may chose to withhold payment equal to the sum of the potential liquidated damages.

E. Transmittal: Submit 2 (two) signed and notarized original copies of each Application for Payment to the Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. Schedule of Values

G. Application for Payment at Substantial Completion: After the Certificate of Substantial Completion is issued by the Owner, 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.
   2. Include documentation that Operation and Maintenance Manuals and As-built Drawings as required by contract have been transmitted to the Architect/Owner, if required.
   3. Provide certificates of final inspection(s) and use and occupancy permit(s) from City, County, and/or State agencies in accordance with applicable codes, laws, and ordinances, as applicable.
   4. In the event that liquidated damages are due based on the completion of the work in relation to the contract duration, the Owner may chose to withhold payment equal to the sum of the potential liquidated damages.

H. 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 the Project closeout requirements.
   2. A complete set of all approved or reviewed submittals in electronic format.
   3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   4. In the event that liquidated damages are due based on the completion of the work in relation to the contract duration, the Owner may chose to withhold payment equal to the sum of the potential liquidated damages.
   5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   7. AIA Document G707, "Consent of Surety to Final Payment."
   8. Evidence that all claims have been settled

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

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 specifies administrative and procedural requirements for handling and processing Contract modifications.

1.3 CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Changes in the Work, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a) Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b) Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c) Include costs of labor and supervision directly attributable to the change.
    d) Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-

place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 30 days after such authorization.

1.6 CHANGE ORDER PROCEDURES

A. On Architects and Owner's approval of a Proposal Request, Contractor will submit a Change Order for signatures of Owner and Architect on AIA Document G701 or on a form provided by the Owner.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION 01250

SECTION 01252 - REQUEST FOR INFORMATION (RFI)

1. GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for handling and processing a request for interpretation of the Contract Documents.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

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

1.4 REQUEST FOR INFORMATION

A. RFI: An RFI is 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 determine that requested information is not readily inferable from the Contract Documents.

B. The RFI shall **not** be used for 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/ Owner as directed.
   6. Request approval of submittals
   7. Request approval of substitutions
   8. Request coordination of various materials and systems indicated on Contract Documents with field conditions and with each other
   9. Request submitted by someone other than Contractor
   10. Request for a determination on a RFI previously answered
   11. Request with multiple subject items

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.
   1. Electronic copy, in Microsoft Word Document format, of the sample RFI form will be provided to Contractor upon written request.
   2. The Owner will approve the use of similar forms.

2.2 REQUEST FOR INFORMATION LOG

A. As determined by the Owner, a current and accurate Request for Information Log will be maintained by the Owner for duration of Contract.

3. EXECUTION

3.1 PREPARATION, SUBMITTAL, AND REVIEW PROCEDURE

A. Preparation: Complete form. Provide information in all boxes.
   1. Number each RFI sequentially. Numbers are assigned by the Contractor verified by Owner.
   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 an RFI on behalf of subcontractors, material suppliers, fabricators and other Contractor consultants.
5. Prepare a separate form for each subject. Multiple-subject RFI's will be returned.

B. Submittal: Submit signed original RFI by U.S. Postal Service, overnight delivery service or through electronic mail to the Architect/Owner. A copy of each RFI should be simultaneously sent to the Owner, if an Architect is assigned to the project, the on-site inspector and the Contractor superintendent.
1. Electronic submittal of RFI by "e-mail" or "facsimile" is acceptable and preferred
2. Submit completed RFI form including any attachments.

C. Review: Allow three (3) calendar days, from time of receipt, to review and respond. Plan and schedule the Work accordingly. No extension of the Contract Time will be authorized because of failure to provide RFI's in advance of the Work to include Architect/Owner processing time.
1. The Architect/Owner will advise the Contractor within three (3) business days following receipt of an RFI when an RFI will require more than seven (7) business days to provide a response.
2. An RFI may require more than the three (3) business additional review and response time for the following reasons:
   a) Where RFI requires a multiple discipline (mechanical, electrical, structural, etc.) review, coordination and response.
   b) When RFI is complicated and requires review and response from Using Agency, and authority having jurisdiction, product vendor, or another entity other than the Architect/Owner.
   c) Concurrent review of multiple RFI's
   d) Additional information is required from the Contractor in order to review and respond to an RFI. Once information is obtain and is satisfactory accepted, the three (3) days of review, time will start after all information is obtained for review.
3. All RFIs will be answered.
   a) If an RFI requires a significant detail, or input by a vendor, the Contractor shall schedule a meeting to include, but not be limited to, the Owner, the Architect, the Contractor, subcontractors and vendors to discuss and resolve the RFI. The Contractor shall be responsible for recording and distribution of minutes. The Architect/Owner shall be responsible for answering the RFI, recording the RFI, and sending answers out to all parties concerned.

END OF SECTION 01252

FREDERICK COUNTY DIVISION OF PUBLIC WORKS
MYERSVILLE LIBRARY

REQUEST FOR INFORMATION

TO: _____ RFI NO.: _____

ATTENTION: _____ DATE: _____

CONTRACT NO.: _____

PROJECT NAME: _____

PROJECT LOCATION: _____

SUBJECT: _____

SPEC. SECTION: _____ DRAWING NO: _____

_____

REQUEST:

PROPOSED SOLUTION:

DATE RESPONSE
REQUIRED: _____ BY: _____

_____

RESPONSE:

BY:

_____ DATE: _____

SECTION 01270 - UNIT PRICES (UNIT CONTINGENT ITEMS)

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 administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included as specification section 00200d (Unit Contingent Items). Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION 01270

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

4. GENERAL

4.1 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.

4.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Request for Information (RFI)

B. Related Sections include the following:

1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Division 1 Section “Execution Requirements” for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

C. Definitions

1. Request for Information (RFI) – A request from the Contractor seeking a clarification of the Contract Documents

4.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different specification sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
5. Coordinate installation of owner furnished equipment.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to the conservation of energy, water, and materials.

1. Salvage materials and equipment involved in the performance of, but not necessarily incorporated into the work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

4.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components or where coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

   a) Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b) Indicate required installation sequences.
   c) Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 18 by 24 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit four (4) copies of each submittal. The Architect will return two (2) copies.

   a) Submit six (6) copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two (2) copies; the remainder will be returned. Mark up and retain one (1) returned copy as a Project Record Drawing.

4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Contractor must coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. The Contractor must also provide manufacturer's Material Data Safety Sheets (MSDS) and other material content or manufacturing specification information as required and noted in subsequent Specification sections.

C. Key Personnel Names: Within seven (7) calendar days of starting construction operations, submit a list of key personnel, including superintendent, subcontractors, and other personnel in attendance at Project site. Identify telephone numbers, for Contractor's Project Manager and Project Superintendent. These telephone numbers must be provided so that an immediate response can be received by the Owner for Project or Work related emergencies. Provide names and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Keep list current at all times.

4.5 PROJECT MEETINGS

A. General: The Department of Engineering and Construction Management (DECM) will schedule and conduct Progress Meetings at the Project site, unless otherwise indicated. The Contractor will schedule and conduct at the Project site pre-installation meetings and conferences required to complete the construction activities.

1. Attendees: Inform subcontractors and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the Owner and Architect of attendance requirement at coordination meetings or functional tests at least three (3) calendar days in advance of the event.

B. Preconstruction Conference: DECM will schedule a preconstruction conference at a time convenient to Owner, Architect, and Contractor and no later than fourteen (14) calendar days after the execution of the Agreement. DECM will hold the conference at the Project site or another convenient location. DECM will conduct the meeting.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, which may include the following:

a) Tentative construction schedule.
b) Phasing.
c) Critical work sequencing and long-lead items.
d) Designation of key personnel and their duties.
e) Procedures for processing field decisions and Change Orders.
f) Procedures for requests for interpretations (RFIs).
g) Procedures for testing and inspecting.
h) Procedures for processing Applications for Payment.
i) Distribution of the Contract Documents.
j) Submittal procedures. DECM will issue the Submittal Log and describe use of Submittal identifiers.
k) Preparation of Record Documents.
l) Use of the premises.
m) Work restrictions.
n) Owner's occupancy requirements.
o) Responsibility for temporary facilities and controls.

p) Construction waste management and recycling.
q) Parking availability.
r) Office, work, and storage areas.
s) Equipment deliveries and priorities.
t) First aid.
u) Security.
v) Progress cleaning.
w) Working hours.

3. Minutes: DECM will record and distribute meeting minutes.

C. Pre-Installation Meetings: The Contractor will schedule a pre-installation meetings as required by the contract documents and at a time convenient to Owner, Architect, and Contractor. The Contractor will provide no less than fourteen (14) calendar days advance notice of the meeting location, date, and time. The Contractor will conduct the meeting to review responsibilities, personnel assignments, and coordination requirements with all relevant subcontractors.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the pre-installation meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect installation, which may include the following:

a) Tentative construction schedule.
b) Phasing.
c) Critical work sequencing and long-lead items.
d) Designation of key personnel and their duties.
e) Procedures for testing and inspecting.
f) Use of the premises.
g) Work restrictions.
h) Parking availability.
i) Office, work, and storage areas.
j) Equipment deliveries and priorities.
k) First aid.
l) Security.
m) Working hours.

3. Minutes: The Contractor will record and distribute meeting minutes.

D. Progress Meetings: DECM will conduct progress meetings at intervals consistent with the progress.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a) Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will

be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for activities to be completed before next Progress Meeting.

b) Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals. DECM will distribute copies of the Submittal Log monthly.
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) Status of correction of deficient items.
14) Field observations.
15) Requests for interpretations (RFIs). DECM will distribute copies of the RFI Log monthly.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: DECM will record the meeting minutes.
4. Reporting: DECM will distribute minutes of the meeting to each party present and to parties who should have been present.

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Submittals Schedule.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
B. Milestone: A key or critical point in time for reference or measurement.

1.4 SUBMITTALS

A. Submittals Schedule: If required by the Owner, the Contractor shall submit a Submittals Schedule to the Owner prior to the start of work.
B. Construction Schedule: If required by the Owner, the Contractor shall submit a Construction Schedule to the Owner in bar chart format.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the Schedule of Values.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Demolition to Final finish of project.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with recognized scheduling procedures.
B. Time Frame: Extend the schedule from the date established for the Notice-to-Proceed to the date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. In addition to the construction activities, include the following:
   1. Procurement Activities: Include procurement process activities for the long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   2. Startup and Testing Time: Include an activity within the contract duration, for startup and testing, as included in the scope of the work.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: If requested by the Owner, the Contractor shall provide schedule updates during the course of the work.

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

5. GENERAL

5.1 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.

5.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following: Divisions 2 through 33 Sections for specific requirements for submittals in those Sections.

5.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

5.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that requires sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a) Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities. The Architect will provide a list of submittals required by the contract documents so that DECM can assign submittal identifiers and prepare the Submittal Log. The list of required submittals must be sent to DECM at least fourteen (14) calendar days before the pre-construction meeting. If the contract documents require submittals that the Architect later determines are not required, then the Architect will notify DECM so that the Submittal Log can be updated.

C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow fourteen (14) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow fourteen (14) calendar days for review of each resubmittal. In the event a submittal is rejected or returned for correction, a new activity will be inserted into the construction schedule for Resubmission and another for Review of the Resubmission

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) calendar days for initial review of each submittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a) Project name.
b) Date.
c) Name and address of Contractor.
d) Name and address of subcontractor.
e) Name and address of supplier.
f) Name of manufacturer.
g) Submittal number or other unique identifier, including revision identifier. These numbers or identifiers will be assigned by the Department of Construction Management & Inspection (DECM) and issued as the Submittal Log during the pre-construction meeting. If additional identifiers are required after the pre-construction meeting, those identifiers will be issued by DECM.
h) Other necessary identification to assist in timely routing of the submittal.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for the final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, the initial submittal may serve as final submittal.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The Architect will discard submittals received from sources other than Contractor's Project Manager.

1. Transmittal Form: Provide locations on form for the following information:

a) Project name and number.
b) Date.
c) Destination (To:).
d) Source (From:).
e) Names of subcontractor, manufacturer, and supplier.
f) Submittal Number or Identifier.
g) Submittal purpose and description.
h) Specification Section number and title.
i) Drawing number and detail references, as appropriate.
j) Transmittal number.
k) Submittal and transmittal distribution record.
l) Remarks.
m) Signature of transmitter.

H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked “No Exception Taken” or “Approved as Noted”.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating “No Exception Taken”, or “Approved as Noted” by Architect.

5.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. Electronic drawings will be in the AutoCAD form for the convenience of the Contractor in the preparation of shop drawings. Electronic drawings shall not be considered to be contract documents, and the Contractor shall be responsible for the verification of all dimensions and interfaces between systems. Reproductions of CAD files submitted as shop drawings shall be rejected. CAD files provided may contain revisions after the date of the contract documents, which may or may not be flagged, and may contain information on frozen or “off” layers that has been superseded or discarded during project development, as well as information beyond the limits of drawing sheet layouts.
2. Contractor shall pay Architect time and printing costs (Not to exceed $200) to reproduce Architect’s files.
3. Contractor must sign the Architect’s Limitation of Liability Release Form in order to receive the CAD files.

6. PRODUCTS

6.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a) Manufacturer's written recommendations.
b) Manufacturer's product specifications.
c) Manufacturer's installation instructions.
d) Standard color charts.
e) Manufacturer's catalog cuts.
f) Wiring diagrams showing factory-installed wiring.
g) Printed performance curves.
h) Operational range diagrams.
i) Mill reports.
j) Standard product operation and maintenance manuals.
k) Compliance with specified referenced standards.
l) Testing by recognized testing agency.

m) Application of testing agency labels and seals.
n) Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit ten (10) copies of Product Data, unless otherwise indicated. The Architect will return three (3) copies to the Contractor, two (2) copies to the County Project Manager, and three (3) copies to the DECM Program Manager. The Architect will retain two (2) copies for their records and their subcontractors.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a) Dimensions.
b) Identification of products.
c) Fabrication and installation drawings.
d) Roughing-in and setting diagrams.
e) Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f) Shopwork manufacturing instructions.
g) Templates and patterns.
h) Schedules.
i) Design calculations.
j) Compliance with specified standards.
k) Notation of coordination requirements.
l) Notation of dimensions established by field measurement.
m) Relationship to adjoining construction clearly indicated.
n) Seal and signature of professional engineer if specified.
o) Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit ten (10) copies of Shop Drawings, unless otherwise indicated. The Architect will return three (3) copies to the Contractor, two (2) copies to the County Project Manager, and three (3) copies to the DECM Program Manager. The Architect will retain two (2) copies for their records and their subcontractors.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a) Generic description of Sample.
b) Product name and name of manufacturer.
c) Sample source.
d) Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a) Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b) Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a) Number of Samples: Submit three (3) full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The Architect will return one (1) copy with options selected to the Contractor, and one (1) copy to the DECM Program Manager for use in the field office.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a) Number of Samples: Submit three (3) full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The Architect will return one (1) approved copy with options selected to the Contractor, and one approved (1) copy to the DECM Program Manager for use in the field office.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section for Construction Manager's action.

F. Submittals Schedule: Comply with requirements specified in Division 1 Section for Construction manager’s action.

G. Application for Payment: Comply with requirements specified in Division 1 Section "Price & Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 1 Section "Price & Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

    1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three (3) copies of subcontractor list, unless otherwise indicated. The Architect will return one (1) copy to the Contractor and one (1) copy to the DECM Program Manager.

    a) Mark up and retain one returned copy as a Project Record Document.

J. Coordination Drawings: Comply with requirements specified in Division 1 Section 01310.

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

T. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section for Inspection, Testing & Laboratory Services.

U. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section 01770 Closeout Procedures.

Y. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Z. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

AA. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

BB. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

CC. Construction Photographs: Comply with requirements specified in Division 1 Section 01322 Photographic Documentation.

6.2 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

7. EXECUTION

7.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with an approval stamp, stating that the submittal has been reviewed by the Contractor and is in compliance with the contact documents, before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number or identifier, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

7.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S / ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

B. Architect’s Responsibility

1. The Architect will review each submittal only for conformance with design concepts and compliance with the Contract Documents. The Architect will not be responsible for reviewing the quantities or verifying dimensions. The Architect will mark each submittal to indicate an appropriate action, and then return the submittal.
2. Action Stamp: The Architect will stamp each submittal with a self-explanatory action stamp. The stamp will be appropriately marked to indicate the action required by the Contractor.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 - QUALITY REQUIREMENTS

GENERAL

SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Mock-up requirements.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

QUALITY CONTROL AND CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

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

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

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

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Landscape Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from the LA/E before proceeding.

E. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Landscape Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections. Refer to individual section for mock-up requirements.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Landscape Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Landscape Architect.

TESTING AND INSPECTION SERVICES

A. The County will hire an independent firm to perform testing as required by the Contract Documents.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by the Architect/Engineer or Owner.

C. Testing, inspections and source quality control may occur on or off the project site.

D. Reports will be submitted by the independent firm to the Architect/Engineer, Owner and Contractor, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. The General Contractor and their subcontractors, suppliers, and vendors will cooperate with the independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and provide assistance by incidental labor as requested.
   1. Notify Owner's representative and independent firm at least 48 hours prior to expected time for operations requiring services.

F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by DECM at the expense of the General Contractor.

H. Agency Responsibilities:
1. Test samples of mixes submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify DECM and Contractor of observed irregularities or non-conformance of Work or products.
6. Attend meeting when requested by Owner.

I. Representatives of the testing laboratory shall have access to the work at all times and at all locations where the work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly

MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to DCM. 30 days in advance of required observations. Observer is subject to approval of DECM and LA/E.

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

D. Refer to Section 01330 - SUBMITTAL PROCEDURES

PRODUCTS - NOT USED

EXECUTION

1.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

1.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 SCHEDULE – NOT USED

END OF SECTION

SECTION 01525 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. See Division 1 Section for progress cleaning requirements.

1.2 DEFINITIONS (NOT USED)

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Contractor will apply for temporary building permit and be responsible for permit fees, if applicable.

1.4 SUBMITTALS (NOT USED)

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.

PART 2 - PRODUCTS

2.1 MATERIALS (NOT USED)

2.2 EQUIPMENT

A. The Contractor shall provide a suitable office in an approved location on or in the immediate vicinity of the project for the exclusive use of checking drawings and specifications, conducting

tests of materials, etc. and for storing of Engineer's field equipment testing apparatus and records. The contractor shall provide a minimum of two parking spaces for County personnel.

The office shall be separate from any building used by the Contractor. The office shall have a minimum of 200 square feet or the contractor may furnish an adequately arranged trailer space equivalent to the minimum requirements for an office approved by the Owner.

1. The office shall be set up, equipped and made ready for use prior to the beginning of other work on the project, and shall remain until all field records pertinent to the project have been completed. It shall be maintained in good condition and appearance by the Contractor for the duration of the project and shall then be removed and disposed of by him and the site cleaned up and left in a neat and acceptable condition.
2. It shall be attractively painted on the outside and provided with a sign at least four (4) feet long and one (1) foot high lettered to read as follows: -- FIELD OFFICE --. The letters, not less than 3 inches high, shall be white on black background and the sign shall have a white border, at least 1-1/2 inches wide, around it.
3. All doors shall be equipped with locks and outside locking bar.
4. Windows, to furnish natural light, shall be constructed so as to open and close and shall have latches. Provide metal window protection on all windows.
5. Screens shall be provided for all windows and exterior doors, and the building shall be generally fly-tight. The screen doors shall be equipped with springs and latches.
6. The office shall be supplied with satisfactory artificial lighting and lighting service for the duration of the project. Electric lights and current shall be supplied and at least two duplex convenience outlets shall be installed in each room.
7. If work is in progress during cold weather, the office shall be heated to at least 68 degrees Fahrenheit by means of approved type heaters. If work is in progress during warm weather the office shall be cooled to at least 78 degrees Fahrenheit by means of an approved type air conditioning unit. Current or fuel, as required, shall be supplied by the contractor.
8. All offices shall be provided with neat, sanitary toilet and hand washing accommodations for the use of the County employees and such facilities shall meet the requirements of the State Department of Health or other authorities having jurisdiction.
9. The office shall be furnished with the equipment as noted herein and as listed in the tabulation which follows:
    a. One office type desk having at least two drawers on each side and minimum top dimensions of not less than 32" x 60".
    b. One comfortable chair and one (1) stool with drafting table.
    c. One file cabinet
    d. Two utility tables, as required, 30" high and having top dimensions of not less than 30" x 84".
    e. One sanitary type water cooler supplied with water, which shall be kept cooled.
    f. One fire extinguisher – Dry Chemical, Multi-purpose ABC (minimum size, 10 pounds) equipped with a visual air pressure gauge. The fire extinguisher shall be checked monthly for stored pressure, etc,; also checked and tagged annually and after each use by a licenses company.
    g. One (1) First Aid Kit equivalent to 24-unit first aid kit described on page 193 of First Edition, 1973, of "Standard First Air and Personnel Safety" – The first air kit shall be checked monthly and replenished to full complement.
    h. 8 folding chairs
    i. Broom, dust pan, trash receptacles

j. Provide printer, copier – Canon Colorimage class model #MF726 or equal, provide all supplies and maintenance.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate the Owner's facilities where they are shown on the plans and approved by the Owner. Relocate and modify facilities if approved by the Owner.

B. Provide each facility ready for use when needed to avoid delay. Field offices must be located within seven (7) calendar days after construction notice-to-proceed and have permanent power within fourteen (14) calendar days after construction notice-to-proceed. Maintain and modify as required. Do not remove until facilities are no longer needed or no earlier than 30 calendar days after Final Completion.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with applicable local codes and utility company recommendations.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
   3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Heating and Cooling: Provide temporary heating and cooling required.

3.3 SUPPORT FACILITIES INSTALLATION (NOT USED)

3.4 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no earlier than thirty (30) calendar days after Final Completion.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor.

END OF SECTION 01525

SECTION 01569 – CONSTRUCTION CLEANING

PART 4 - GENERAL

4.1 SECTION INCLUDES

A. Cleaning and disposal of Contractor generated waste materials, debris, and rubbish for the duration of the contract.

B. Cleaning and disposal of Contractor and Owner generated field office waste materials, debris, and rubbish for the duration of the contract.

4.2 RELATED DOCUMENTS

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

4.3 RELATED SECTIONS

A. Division 1 Specification Sections.

PART 2 – PRODUCTS

2.1 EQUIPMENT

B. Provide covered containers for deposit of waste material, debris, and rubbish.

PART 3 – EXECUTION

3.1 CLEANING

A. Maintain project limits free of waste material, 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 ductwork, pipes, structures, and other closed or remote spaces, prior to closing the space and/or as instructed by the Owner or the County's Field Project Manager.

D. Daily clean interior to provide suitable conditions for work. Vacuum floors daily and maintain the building in a dust free condition at all times. Include wiping and wet mopping as needed.

E. Broom and wet mop interior areas prior to start of surface finishing, and continue cleaning on an as-needed basis.

F. Control cleaning operations so that dust and other particles will not adhere to wet or newly coated surfaces.

G. Collect and dispose of all trash generated by the Contractor and Owner field offices on a daily basis.

H. Broom clean and remove from Contractor and Owner field offices on a daily basis at 3:00 PM.

I. Wet mop Contractor and Owner field offices every Friday at 3:00 PM.

J. 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.

3.2 DISPOSAL

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

END OF SECTION 01569

SECTION 01600 - PRODUCT REQUIREMENTS

GENERAL

SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

PRODUCTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for components being replaced.

PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

J. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner. Additional time required to secure replacements and to make repairs will not be considered by the Owner to justify an extension in the Contract Time of Completion.

PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

PRODUCT SUBSTITUTION PROCEDURES

A. Substitutions are acceptable per the procedures listed in specification section 01630.

B. Substitution Request during construction:
1. During construction, if a substitution request is made, and if the specified material is available, the Owner and Architect may require a credit change order to the contract if proposed substitution is accepted.

PRODUCTS - NOT USED

EXECUTION - NOT USED

END OF SECTION

SECTION 01630 - 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 REQUIREMENT

A. The Architect will consider requests for substitution if received during the bid process. Substitution requests must be submitted prior to ten (10) calendar days of the published bid opening.
   1. Requests received within ten (10) calendar days of the published bid opening may be considered or rejected at discretion of Architect.
   2. Requests received after bid opening will be considered by the Owner based on the guidance of the Architect. The decision is entirely the Owner's and will be made based on the Architect's guidance and the time and cost benefits of the substitution.

B. Conditions required for substitution requests: The Architect and Owner 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 Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   5. Owner's approval.

C. Contractor's submittal and Architect'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 will be considered defective.

1.3 SUBMITTALS

A. Comply with Division 1 Section Submittal Procedures.

B. Substitution Request Submittal:
   1. Submit 3 copies of each substitution request form utilizing *CSI Advancement of Construction Technology Substitution Request Form.*
   2. Identify product to be replaced in each request. Include related Specification Section, Submittal Reference Number if assigned, and Drawing numbers.
   3. Provide complete documentation showing compliance with requirements for substitutions.
   4. Include coordination information necessary to accommodate proposed substitution.
   5. Include a detailed comparison of significant qualities of proposed substitution with those of product specified.
   6. Provide samples, where applicable or requested.
   6. Include cost information, including a proposal of net change in Contract Sum.
   7. Include construction schedule information, including a proposal of net change in Contract Duration.
   8. 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 or 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 Architect'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 ARCHITECT'S AND OWNER'S ACTION

A. The Architect and Owner will review and take appropriate action upon Contractor's request for substitutions.

1. The Architect's and Owner's action will be taken with reasonable promptness, while allowing sufficient time in professional judgment to permit adequate review.
2. The Architect and Owner shall be entitled to rely upon adequacy, accuracy, and completeness of data, and certifications prepared by Contractor.
3. If necessary, the Architect and Owner may 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 01700 - EXECUTION REQUIREMENTS

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 general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
3. Division 1 Section "Closeout Procedures" for submitting Project Record Documents, and final cleaning.

1.3 QUALITY ASSURANCE (NOT USED)

2. PRODUCTS (NOT USED)

3. EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

3.4 FIELD ENGINEERING (NOT USED)

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels. Noisy operations must be completed before 7 am in the morning.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Pre-installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate. See section on Infection Control for renovation work.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

SECTION 01731 - CUTTING AND PATCHING

PART 5 - GENERAL

5.1 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.

5.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
3. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

5.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

5.4 SUBMITTALS

5.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

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 results in increased maintenance or decreased operational life or safety.

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 construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

5.6 WARRANTY

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

PART 6 - PRODUCTS

6.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 7 - EXECUTION

7.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

7.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

7.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

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.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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

END OF SECTION 01731

SECTION 01740 – CORRECTIVE WORK PERIOD/WARRANTY REQUIREMENTS

PART 8 - GENERAL

8.1 SUMMARY

A. Administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

8.2 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

8.3 CORRECTIVE WORK PERIOD

A. Within two years from date of Certificate of Substantial Completion, the Contractor is notified in writing by the Owner that any item of equipment, materials, and/or workmanship has proved defective or that it is not meeting the specification requirements, he shall immediately replace, repair or otherwise correct the defect in deficiency without cost to the Owner.

B. The Contractor shall also replace or repair to the satisfaction of the Contractor, any and all damage done to the building or its contents or to work of other trades in consequence of work performed in fulfilling this corrective work period requirement.

C. This clause is general in nature and shall not operate to waive stipulation of other clauses which specify corrective work periods in excess of two years.

8.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction or warranted construction.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner had benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
   1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. When the Contract Documents require a special warranty, or similar commitment on the work or part of the work, the Owner reserves the right to refuse to accept the work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

END OF SECTION 01740

SECTION 01770 - CLOSEOUT PROCEDURES

1. GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Operation and maintenance manuals.
3. Warranties.
4. Instruction of Owner's personnel.
5. Extra Stock.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
3. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Date of Substantial Completion: Contract duration minus thirty (30) calendar days.

B. When the Contractor considers the Work is substantially complete, the Contractor will submit a written notice to the DECM Construction Manager and Architect at least thirty-seven (37) calendar days prior to the last day of the contract duration.

C. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Contractor’s written notice to the Architect and the Department of Engineering and Construction Management requesting Substantial Completion Inspection shall have Certificate of Occupancy enclosed with request.
2. The Contractor must prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete. This punch list must be distributed with the meeting invitation for the substantial completion inspection. The Architect and Owner will agree to the value of the punch list items. In the event there is a dispute as to the value, the Owner’s decision is final.
3. Advise Owner of pending insurance changeover requirements.
4. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
5. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
6. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
7. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
8. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
9. Complete startup testing of systems.

10. Submit test/adjust/balance records.
11. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
12. Advise Owner of changeover in heat and other utilities.
13. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
14. Complete final cleaning requirements, including touchup painting.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the Owner's Construction Manager will either proceed with scheduling the inspection or notify the Contractor of unfulfilled requirements. The Owner's Construction Manager will schedule the substantial completion inspection and observe the substantial completion inspection on the date established for substantial completion and in the presence of the Contractor. The substantial completion inspection will take place on only one day and at a specific time, so if there are design team members unavailable for the scheduled inspection, they will coordinate with the Owner's Construction Manager to visit the site in advance. During the substantial completion inspection, the Owner's Construction Manager is responsible for documenting the items identified as deficient, distributing the punch list, and determining if the issue has been resolved. With the distribution of the punch list, the Owner's Construction Manager will identify when corrections to the punch list need to be submitted. The Owner's Construction Manager is the sole person who can add items to the punch list within the comment period. The Owner will prepare the Certificate of Substantial Completion after inspection and in compliance with provisions of the General Conditions of the Contract or will notify Contractor of items, either on Contractor's list or additional items identified by the Owner's Construction Manager or the Architect, which must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous final inspections as incomplete is completed or corrected. The cost associated with a second substantial completion inspection, and subsequent inspections shall be deducted from the contract sum at the established labor rate of the Architect (currently $100 per hour) to include direct costs associated with travel to second and subsequent substantial completion inspections.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Final Completion Date:

1. Five (5) days prior to the last day of the contract duration.
2. When the Contractor considers the Work is complete, he must submit a written certification to the DECM Construction Manager and the Architect at least twelve (12) days prior to the last day of the contract duration. The written notification shall be titled "Notice – Certification of Final Completion".
3. The "Notice – Certificate of Final Completion" shall include certification of the following:

    a) The Contractor has reviewed contract documents.
    b) The Contractor for compliance with contract documents has inspected work.
    c) Work has been completed in compliance with the contract documents and deficiencies listed with the Certificate of Substantial Completion have been corrected. A copy of the punch list with the initials of the DECM Construction Manager, Architect, and Owner's Project Manager must be included.
    d) Equipment has been tested, adjusted, balanced, and are fully operational.
    e) The Operation of systems has been demonstrated to the Owner's Maintenance personnel and professionally filmed.
    f) Project Record Documents have been submitted to and approved by the Owner.

B. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit a certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the Owner's Construction Manager and the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

C. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, the Owner's Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. The Owner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. The cost associated with a second final completion inspection, and subsequent inspections shall be deducted from the contract sum at the established labor rate of the Architect to include direct costs associated with travel to second and subsequent substantial completion inspections.
2. The DECM Construction Manager will prepare a Certificate of Final Completion in compliance with the provisions of the General Conditions of the Contract when the Owner has been determined the work to be complete.
3. When the Owner determines the Work is complete, the Contractor will submit all Closeout Submittals.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from the front door.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a) Project name.
    b) Date.
    c) Name of Architect.
    d) Name of Construction Manager.
    e) Name of Contractor.
    f) Page number.

1.5 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a) Emergency instructions and procedures.
b) System, subsystem, and equipment descriptions, including operating standards.
c) Operating procedures, including startup, shutdown, seasonal, and weekend operations.
d) Description of controls and sequence of operations.
e) Piping diagrams.

2. Maintenance Data:

a) Manufacturer's information, including list of spare parts.
b) Name, address, and telephone number of Installer or supplier.
c) Maintenance procedures.
d) Maintenance and service schedules for preventive and routine maintenance.
e) Maintenance record forms.
f) Sources of spare parts and maintenance materials.
g) Copies of maintenance service agreements.
h) Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.7 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. Product warranties start on date established by architect for Substantial Completion. Owner may request a later starting date on specific equipment that has been identified as incomplete on Substantial Completion date. Such extension shall be made in writing to Contractor by Architect.

1.8 REINSPECTION FEES

A. Should the status of the completion of work require re-inspection by the Owner or Architect due to failure of the Contractor to comply with claims on the initial, substantial, or final inspections, the Owner will deduct the amount of the Architect's fees and costs for re-inspection from the final payment to the Contractor.

1.9 CLOSEOUT SUBMITTALS

A. Evidence of compliance with requirements of governing authorities

1. Certificate of Occupancy
2. Certificates of inspection required for Mechanical, electrical, and plumbing systems
3. Certificate of inspections for conveying systems
4. Operation and Maintenance manuals
5. Warranties and Bonds
6. Evidence of payment and release of Liens
7. Consent of Surety to Final Payment

B. Define how the Commissioning Authority will function, their responsibilities and deliverables during project close out.

2. PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3. EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, through Architect, with at least seven (7) calendar days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.

6. Maintenance.
7. Repair.

3.2 EXTRA STOCK

A. Extra Stock: All “extra material” is to be boxed or packaged; each package is to be clearly labeled.

END OF SECTION 01770

SECTION 01781 - PROJECT RECORD DOCUMENTS

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following: One (1) copy of all documents shall be submitted in an electronic format.
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Record Shop Drawings

B. Related Sections include the following:
   1. Division 1 Specification Sections

1.3 SUBMITTALS

A. Record Drawings: Submit two set(s) of marked-up Record Prints, where required.

B. Record Product Data: Submit two copies of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

C. Approved Substitution Requests

D. Test Reports

E. Inspection Certificates

F. Manufacturer's Certificates

2. PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a) Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b) Accurately record information in an understandable drawing technique.
      c) Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a) Dimensional changes to Drawings.
      b) Revisions to details shown on Drawings.
      c) Depths of foundations below first floor.
      d) Locations and depths of underground utilities.
      e) Revisions to routing of piping and conduits.
      f) Revisions to electrical circuitry.
      g) Actual equipment locations.
      h) Duct size and routing.
      i) Locations of concealed internal utilities.
   3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If the Shop Drawings are marked, show cross-reference on the Contract Drawings.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect/Owner determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
   1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
   2. Consult Architect/Owner for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Identification: As follows:
      a) Project name.
      b) Date.
      c) Designation "PROJECT RECORD DRAWINGS."
      d) Name of Architect.
      e) Name of Contractor.

2.2 (NOT USED)

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

3. EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

END OF SECTION 01781

SECTION 01782 - OPERATION AND MAINTENANCE DATA

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 administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation manuals for systems, subsystems, and equipment.
   2. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

B. Related Sections include the following:
   1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
   3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
   4. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit 1 draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return the copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments. Submit 2 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

2. PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect.
   7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a) If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b) Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions.
   2. Performance and design criteria if Contractor is delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   6. Normal shutdown instructions.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard printed maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

3. EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

E. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01782

SECTION 01787 - SPARE PARTS AND MAINTENANCE MATERIALS

1. GENERAL

1.1 SECTION INCLUDES

A. Products required.

B. Storage and delivery of products.

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 PRODUCTS REQUIRED

A. Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in other Sections to be furnished to Owner, in addition to requirements for completion of work.

B. Products:

1. Identical to those installed in the Work.
2. Include quantities in original purchase from supplier to avoid variations in manufacture.

1.5 STORAGE AND MAINTENANCE

A. Store working stock with products to be installed in the Work.

B. Following delivery of products to site, maintain spare products in same space and condition as products to be installed in the Work.

1.6 DELIVERY

A. Coordinate with Owner:

1. Provide Owner and Engineer a copy of an itemized list of all specified working stock, spare parts, and components 30 days prior to Substantial Completion for review and approval.
2. Deliver all specified spare parts and items to the Owner on one single day.
3. Delivery shall occur 15 days prior to Substantial Completion.
4. Deliver to Owner itemized products and unload spare products at location designated by Owner.
5. Inventory and obtain signed receipt from Owner at time of delivery.
6. Missing items shall be identified in the inventory and provided with new items within 10 days of receipt of original delivery.
7. Damaged items shall be identified in the inventory and replaced with new items within 10 days of receipt of original delivery.
8. Repeat inventory process and obtain signed receipt from Owner at time of delivery of missing or replacement items.
9. Identify itemized products in monthly Payment Application and attach copy of inventoried products and signed receipt.
10. Attach copy of Owner signed and accepted spare parts inventory list to Notice of Substantial Completion letter.

2. PRODUCTS (NOT USED)

3. EXECUTION (NOT USED)

END OF SECTION 01787

PROJECT MANUAL

Myersville Library

8 Harp Place
Myersville, MD 21773

April 10, 2018

ARCHITECT
Noelker and Hull Associates, Inc.
6 North East Street
Suite 300
Frederick, MD 21701

MECHANICAL / ELECTRICAL ENGINEER
CJL Engineering
3 West Second Street
Frederick, MD 21701

CIVIL ENGINEER
Harris Smariga & Associates
125 South Carroll Street
Frederick, MD 21701

STRUCTURAL ENGINEER
Abel Consulting Engineers, Inc.
9055 Comprint Court
Suite 370
Gaithersburg, MD 20877

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END OF TABLE OF CONTENTS

DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for Project, prepared by ECS Mid-Atlantic, LLC, in Report No. 13:8337 dated 13 December 2017 (Revised January 17, 2018), and is appended to this Document.

END OF DOCUMENT 003132

ECS Mid-Atlantic, LLC

Revised Geotechnical Engineering Report

Myersville Library

Harp Place
Myersville, Maryland

ECS Project Number 13:8337

December 13, 2017
Revised January 17, 2018

December 13, 2017
Revised January 17, 2018

Mr. Dan McDougal
Noelker & Hull Associates, Inc.
6 N. East Street
Suite 300
Frederick, Maryland, 21701

ECS Project No. 13:8337

Reference: Revised Geotechnical Engineering Report
Myersville Library
Harp Place
Myersville, Frederick County, Maryland

Dear Mr. McDougal:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 13:9043-GP, dated July 25, 2017 and Change Order #1 dated October 6, 2017. This report presents our understanding of the geotechnical aspects of the project along, the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Noelker & Hull Associates, Inc. during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Mid-Atlantic, LLC

Gregory A. Ratkowski, P.E.
Geotechnical Department Manager
gratkowski@ecslimited.com

Jeffrey A. McGregor, P.E.
Principal Engineer
jmcgregor@ecslimited.com

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No.: 30901 Expiration Date: 08/15/2018

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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The geotechnical exploration performed included nine (9) soil test borings drilled to depths between approximately 10 and 15 feet and eleven (11) test pits excavated to depths between approximately 2.5 to 7 feet.

- Beneath the surface cover, existing fill materials were encountered in seven (7) soil borings and nine (9) of the test pits. The fills extended to depth of up to 8.5 feet below existing grades. Natural soils were encountered below the surface cover and fill materials with the natural soils extending to depths greater than 15 feet. Decomposed rock material was encountered in two borings, B-1 and B-20, at depths of 13.5 feet below the ground surface. The natural soils were classified as SILT (ML, ML/CL) and GRAVEL (GP-GM).

- A portion of the silt, sand, and gravel soils encountered at the site are generally expected to be suitable for reuse as engineered fill; however, highly plastic soils (CH and MH soils) and are considered unsuitable by virtue of their plasticity. Moisture conditioning is likely to be necessary based on the measured in-situ moisture contents.

- Highly plastic soils (CH and MH) were encountered in the soil borings. These plastic soils have low shear strength and will affect pavement subgrades and slabs on grade. Foundations should not be placed directly on these soils. Specific details on addressing these plastic soils are contained in the body of the report.

- Construction debris (concrete, asphalt, brick, pipe, and plastic) and organics (wood) were encountered in several of the test pits performed at the site, including some within the proposed library building footprint.

- The planned library building can be supported by conventional shallow foundations consisting of individual column footings and continuous wall footings bearing on natural soils or new structural fills. Footings should NOT be supported on the existing fill materials, or directly high plasticity (CH, MH) soils. Details of the assumed foundation subgrade elevations and loads are contained in the body of the report. Foundations can be designed for a net allowable bearing pressure of 3,000 psf.

- Groundwater was not encountered in the borings or test pits to the depths explored (2.5 to 15 feet below existing grades), therefore groundwater is not expected to be a significant issue for the planned at-grade construction at the site.

- Decomposed rock material was encountered in two of the borings (B-1 and B-2) at depths of 13.5 feet below existing grade. Decomposed rock was not encountered to the depths explored at the remaining boring locations. Therefore, we anticipate that materials

requiring difficult excavation techniques will generally be below the planned site grading and most of the cuts not in excess of 10 feet.

- In-situ infiltration testing was performed at four (4) locations at depths ranging from 5.1 and 6.2 feet below existing grade. The measured infiltration rates were within a range of 0.00 and 0.18 inches per hour. Stormwater management via infiltration is not expected to be feasible at this site.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information for the design of the proposed Myersville Library foundations, pavements, and stormwater management facilities.

The recommendations developed for this report are based on project information supplied by Noelker & Hull Associates, Inc. and Harris Smariga. This report contains the results of our subsurface explorations and laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of planned library and surrounding paved parking, and SWM facilities.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the library, pavements, and stormwater management facilities, nine (9) soil borings and eleven (11) test pits were performed at locations selected by Noelker & Hull Associates, Inc., Harris Smariga, and ECS. The borings were located at regular intervals within the footprint of the proposed library building, within proposed pavement areas and at proposed stormwater management areas. The test pits were located within or adjacent to the footprint of a school building which was previously located at the site, as outlined on the Boring Location Diagram. A laboratory-testing program was also implemented to characterize the physical and engineering properties of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our test boring and test pit logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills and delineation of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling.
- Recommended foundation type(s).
- Evaluation and recommendations relative to groundwater control.
- Recommendations for stormwater management facilities.
- An evaluation of soil and rock excavation issues.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 13:9043-GP, dated July 25, 2017 and Change Order #1 dated October 6, 2017, and the Consultant Agreement between ECS Mid-Atlantic, LLC and Noelker & Hull Associates, Inc.

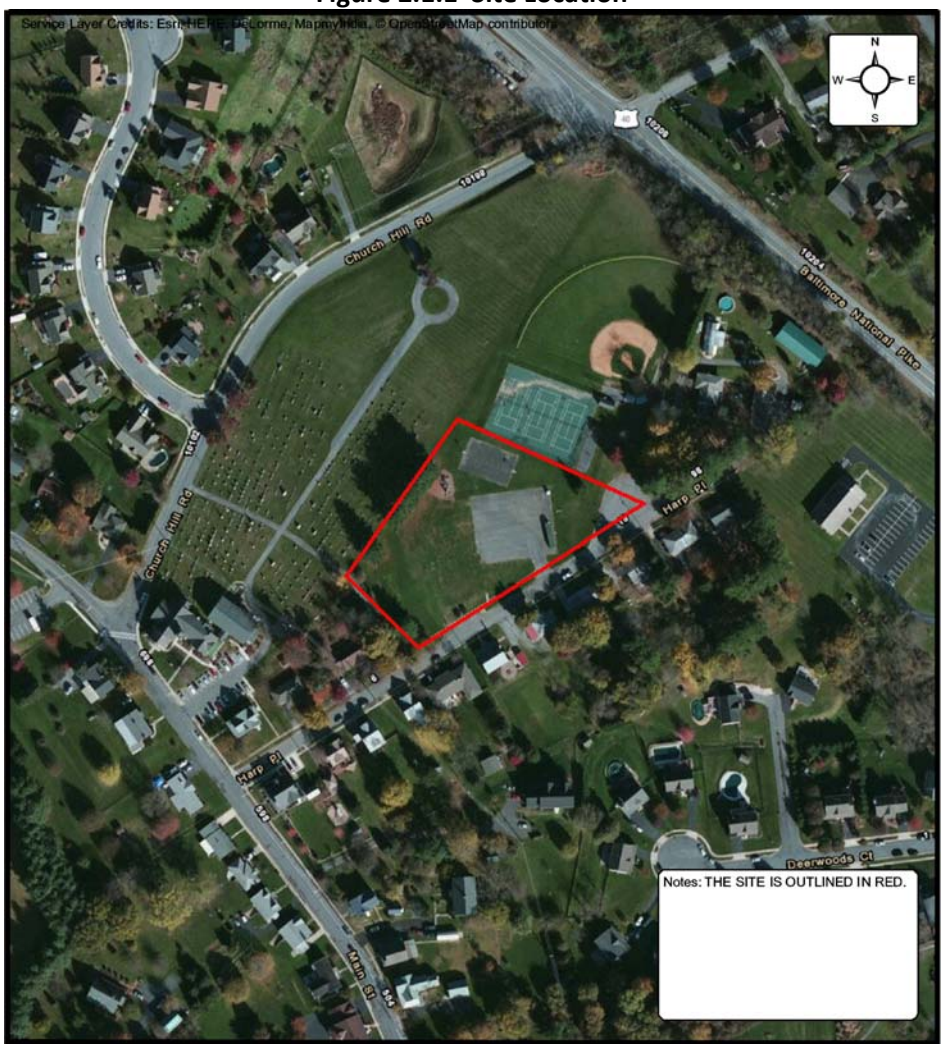
2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located along the northwest side of Harp Place in Myersville, Maryland. Specifically, the site is bounded by Harp Place on the southeast, a single family home on the southwest, the Mount Zion United Methodist Church Cemetery on the northwest, and the Myersville Community Park on the northeast.

Figure 2.1.1 below, shows the approximate project location. A Site Location Diagram has been included as Figure 1 in Appendix A.

Figure 2.1.1 Site Location



2.2 PAST SITE HISTORY/USES

Prior to the construction of the Myersville Library, the site was previously occupied by a school building with associated parking lot and playground areas. The school parking lot, which was located on the northeast side of the school, still remains and the playground that was located

north of the school building was reported to have been recently removed. It is our understanding that the southern end of the school building was built at grade and that the northern end (the gymnasium) was built partially below grade. The school building had been demolished previously and the resulting excavation reportedly filled in with CR6 stone material. No testing or observation reports on this material were provided to us.

An underground storage tank (UST) supplying heating oil to the school was reported to be located on the northwest side of the school building. The land in this area is currently depressed. ECS was told that the UST was removed at the time of the school building demolition. A portion of the site was also reported to have been used as a staging area for local construction activity. The following figure shows an aerial of the site taken around April, 2007. The school building, parking lot, and playground are all visible. Also visible is a path leading to the northwest side of the building, in the vicinity of the reported UST location.

Figure 2.2.1

Source: "Myersville, MD." 39 30' 44.65" N and 77 34' 01.29" W. **Google Earth**. April, 2007. November 29, 2017.

2.3 CURRENT SITE CONDITIONS

The site is currently occupied by a grass field, an asphalt parking lot, asphalt basketball court, and recently seeded land. Existing site grades range from approximately EL 686 in the west corner of the site to approximately EL 676 in the northeast side of the site. Site grades within the proposed library building footprint range from approximately EL 682 to EL 680.

2.4 PROPOSED CONSTRUCTION

The project will consist of construction of a 7,064 GSF public library building, with associated parking lot, and stormwater management facilities. Finished floor level for the proposed library has not been provided, however, we assume it will be at or near existing grade (EL 682).

2.4.1 Structural Information/Loads

The following information explains our understanding of the structures and their loads:

Table 2.4.1.1 Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Building Footprint	7,064 SF in plan view.
# of Stories	1 story above grade, no basement levels (assumed by ECS).
Usage	Library.
Framing	We anticipate that the building will be principally structural steel with reinforced masonry walls.
Column Loads	Maximum 75 kips (Assumed by ECS).
Wall Loads	6 kips per linear foot (klf) maximum (Assumed by ECS).
Lowest Finish Floor Elevation	Approximately EL 682 (Assumed by ECS).

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

3.1.1 Test Borings

The subsurface conditions were explored by drilling 3 soil test borings within the structural building pad, 3 soil test borings within pavement areas, and 3 soil test borings in stormwater management facility locations. An all-terrain vehicle (ATV)-mounted drill rig was utilized to drill the soil test borings. Borings were generally advanced to depths of 10 to 15 feet below the current ground surface. Subsurface explorations were completed under the general supervision of an ECS geotechnical engineer or geologist.

Boring locations were identified in the field by ECS personnel using GPS techniques prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the topographic plan provided (“Site Concept Plan”, prepared by Harris Smariga).

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained

provide a general indication of soil shear strength and compressibility. Bulk samples taken from the upper 1 to 5 feet of subsurface soils at several boring locations were obtained for subsequent laboratory testing.

3.1.2 Test Pits

A total of eleven (11) test pits were excavated within or adjacent to the footprint of the previously demolished school building. The test pits were excavated by a representative from Frederick County with a John Deere 310J hydraulic backhoe with a maximum reach of about 14 feet. The test pits were completed under the direct supervision of an ECS geologist.

Test pit locations were determined in the field by ECS personnel. Following the completion of the test pits, the excavation locations were recorded with GPS. The approximate test pit locations are included on the Boring Location Diagram. Ground surface elevations noted on our test pit logs were interpolated from the topographic plan provided ("Site Concept Plan", prepared by Harris Smariga).

3.1.3 Storm Water Infiltration Testing

In order to evaluate potential infiltration at this property, four (4) in-situ infiltration tests were performed in offset holes adjacent to test boring locations. The infiltration testing was performed at depths ranging from 5.1 to 6.2 feet below existing grades. Infiltration testing was not performed at SWM-2 and SWM-3 due to fill material being present at the requested test depth.

The in-situ infiltration testing consisted of auguring a soil probe down to the test depth and installing a solid length of five inch diameter PVC pipe. The pipe was then presoaked for 24 hours by filling the pipe with approximately two feet of water. After the initial filling of the pipe, infiltration testing was completed by monitoring the drop in the water level at 60-minute intervals for four hours. The rate of drop over the four total hours is considered the infiltration rate.

The test results are included in Section 5.2.1.

3.2 REGIONAL/SITE GEOLOGY

According to the Physiographic Map of Maryland (2008)[1], the site is located within the Lower Middletown Valley District of the Blue Ridge Physiographic Province. The Blue Ridge Province consists of two prominent ridges separated in the southern half by the rolling to hilly Middleton Valley.

The Lower Middletown Valley District is described as moderately rolling valley floor with a bowl-shaped transverse profile, punctuated by incised valley of Catoctin Creek.

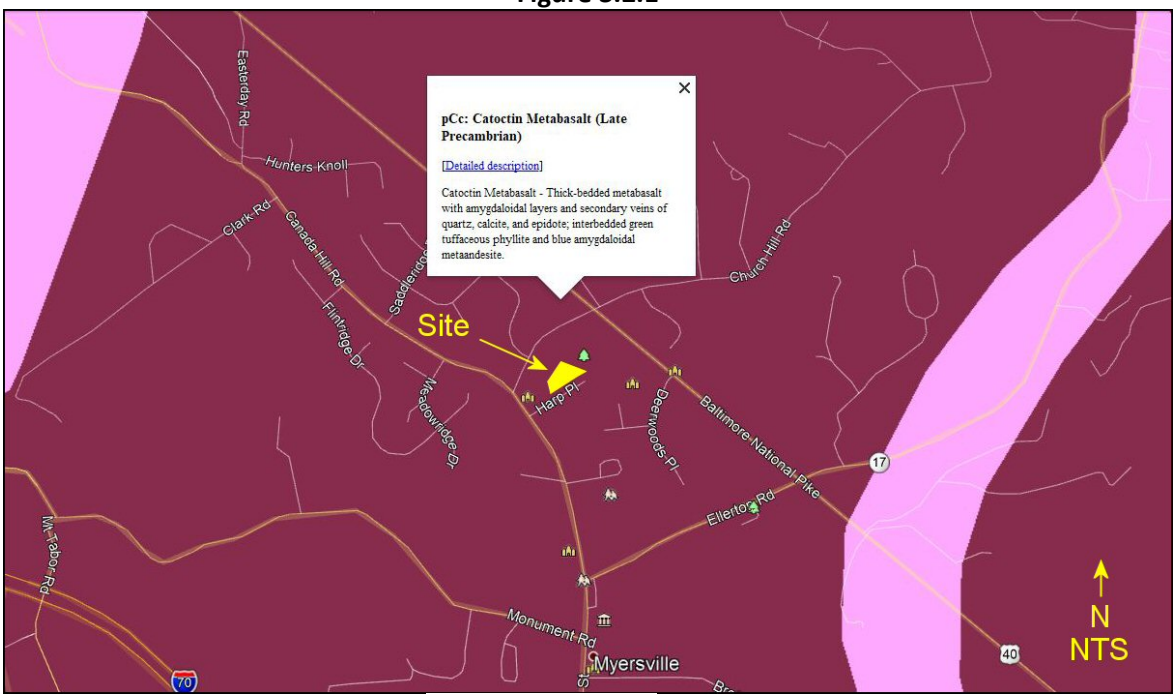
Based upon the Geologic Map of Maryland (1968)[2], the site is underlain by the Catoctin Metabasalt (pCc). The Catoctin Metabasalt is described as thick-bedded metabasalt with

[1] James P. Reger and Emery T. Cleaves. *Physiographic Map of Maryland.* 1:250,000. Maryland Geological Survey, 2008.
[2] Cleaves, E.T., Edwards, J., Jr., Glaser, J.D. Geologic Map of Maryland. 1:250,000. Maryland Geological Survey, Baltimore, Maryland, 1968.

amygdaloidal layers and secondary veins of quartz, calcite, and epidote; interbedded green tuffaceous phyllite and blue amygdaloidal metaandesite.

An overview of the general site geology is illustrated in Figure 3.2.1.

Figure 3.2.1



Geologic map for Figure 3.2.1 obtained from the Geologic Map of Maryland (1968)

3.3 SOIL SURVEY MAPPING

Based on our review of the Soil Survey (USDA - Natural Resources Conservation Service (websoilsurvey.ncrs.usda.gov), the site soils are mapped as the Mt. Zion gravelly silt loam and the Myersville silt loam. These soil types are described with the following properties.

Table 3.3.1 Soil Descriptions

Unit Name	Typical Profile	Natural Drainage Class	Runoff Class	Depth to Groundwater Table	Depth to Restrictive Feature
Mt. Zion gravelly silt loam (MmB)	0-12” gravelly silt loam 12”-48” gravelly loam 48”-69” very gravelly loam 69”-72” unweathered bedrock	Moderately well drained	Medium	About 30 to 48 inches	60 to 80 inches to lithic bedrock
Myersville silt loam (MvB)	0-12” silt loam 12”-35” loam 35”-61” clay loam 61”-71” sandy loam 71”-81” bedrock	Well drained	Medium	More than 80 inches	60 to 80 inches to lithic bedrock

Soil mapping of the site vicinity is presented in Figure 3.3.2 below.

Figure 3.3.2

Soil Survey for Figure 3.3.2 obtained from USDA – Natural Resources Conservation Service; websoilsurvey.nrcs.usda.gov

3.4 SUBSURFACE CHARACTERIZATION

3.4.1 Test Borings

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata encountered during our subsurface exploration. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Table 3.4.1.1 Subsurface Stratigraphy, Soil Borings

Approximate Depth Range (ft)	Elevation (ft)	Stratum	Description	Ranges of SPT[(1)] N-values (bpf)
0.0 - 1.5 ft (Surface cover)	EL 682 – 675.3	n/a	Surface cover consisted of 1 to 8 inches of topsoil (B-2, B-3, P-1, P-2, SWM-1 and SWM-3), 18 inches of gravel (P-3), and 4 inches of asphalt underlain by eight inches of gravel (SWM-2).	N/A
0.08 – 8.5 ft (Fill)	EL 680.9 – 667.5	I	Existing, undocumented fill materials. Fill Materials were encountered at boring locations B-2, B-3, P-2, P-3, and SWM-1 through SWM-3.	4 - 11
0.0 - 15 ft	EL 681.5 – 666	II	Loose to Dense SILT (ML) and firm to stiff SILT (ML/CL, MH) and FAT CLAY (CH), Moist.	5 – 47
13.5 ft	EL 667.5	III	Decomposed rock materials that exhibit rock like qualities. Portions of the decomposed rock will require rock excavation methods for removal. (B-1 and B-2 only)	>60

Notes: (1) Standard Penetration Test

3.4.2 Test Pits

The test pits were performed within or adjacent to the footprint of the previously demolished school in an attempt to characterize the fill material used to backfill the demolition. The following table provides generalized characterizations of the fill encountered during our subsurface exploration. For subsurface information at a specific location, refer to the Test Pit Logs and the Test Pit Photographs in Appendix B.

Table 3.4.2.1 Fill Material Summary, Test Pits

Test Pit Location	Depth of Fill Material		Fill Description
	Feet Below Existing Grade (Ft)	Elevation at Bottom of Fill Material (EL)	
TP-1	N/A	N/A	No fill at test pit location
TP-2	2.0	680	Gravel and Silt fill materials
TP-3	5.5	675.5	Silt and Gravel (CR6) fill materials with concrete and construction debris (pipe)
TP-4	0.3	680.7	Three inches of asphalt covered by one inch of top soil
TP-5	5.0	675.5	Silt and Gravel (CR6) fill materials with slight amounts of brick
TP-6	3.5	367.5	Silt and Gravel (CR6) fill materials with asphalt
TP-7	1.8	677.2	Gravel (CR6) fill materials with slight amounts of concrete
TP-8	2	677	Gravel (CR6) fill materials
TP-9	4	676	Silt and Gravel (CR6) fill materials with organics (wood) and brick
TP-10	5	676	Silt and Gravel (CR6) fill materials with construction debris (plastic) and brick
TP-11	5	676	Silt and Gravel (CR6) fill materials with slight amounts of brick

3.5 GROUNDWATER OBSERVATIONS

Groundwater seepage into our borings and test pits was not observed during our exploration at the depths explored. We did observe borehole caving at a depth of 5 to 10 ft which may be an indicator of groundwater presence. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

Based upon our interpretation of the boring data, it appears that the seasonal high groundwater level is located at depths beyond those explored during this study.

4.0 LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program. Classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties.

Laboratory testing included moisture content testing, Atterberg Limits, washed sieve gradation analyses, moisture-density relationships (Proctor), and California Bearing Ratio tests. The results of the laboratory testing are included in Appendix C.

An experienced geotechnical engineer/engineering geologist visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and ASTM D-2488 (Description and Identification of Soils-Visual/Manual Procedures). After classification, the geotechnical engineer/engineering geologist grouped the various soil types into the major zones noted on the boring logs in Appendix B. The

group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

5.0 DESIGN RECOMMENDATIONS

5.1 BUILDING DESIGN

The following sections provide recommendations for foundation design, soil supported slabs, seismic design parameters and retaining walls

5.1.1 Foundations

Provided subgrades and structural fills are prepared as discussed herein, the proposed structure can be supported by conventional shallow foundations consisting of individual column footings and continuous wall footings. The design of the foundation shall utilize the following parameters:

Table 5.1.1.1 Foundation Design

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure[1]	3,000 psf	3,000 psf
Acceptable Bearing Soil Material	Stratum II (ML, ML/CL) Minimum SPT N-value = 7 bpf	Stratum II (ML, ML/CL) Minimum SPT N-value = 7 bpf
Minimum Width	30 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade)	30 inches	18 inches
Estimated Total Settlement	1 inch	1 inch
Estimated Differential Settlement	Less than 0.5 inches between adjacent columns	Less than 0.5 inches over 50 feet

1. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

It is anticipated that footing subgrades will generally be supported on natural ground or new compacted fill. However, the bases of all foundation excavations should be observed and tested by the Geotechnical Engineer.

Existing, undocumented FILL was encountered at seven (7) of the borings and nine (9) of the test pit locations. Of the borings performed within the proposed footprint of the library, two borings (B-2 and B-3) and three test pits (TP-2, TP-10 and TP-11) contained fill materials. Fill materials are likely to be encountered in other portions of the site not included in this study. ***These existing fill materials are considered unsuitable for direct foundation support.***

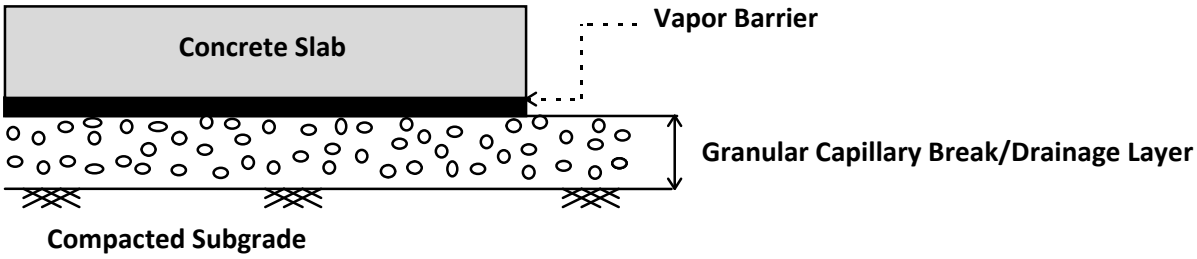
FAT CLAY (CH) and ELASTIC SILT (MH) was encountered in three of the borings performed for this study and may be encountered in other portions of the site not included in this study. Highly plastic soils and/or zones of soft, wet soil materials are typical of the site geology.

If highly plastic soils, existing fill or other unsuitable soils are encountered at planned subgrade levels for any footing, the unsuitable soils shall be undercut to suitable bearing materials. Undercuts of highly plastic materials can be limited to a depth of 4 feet below final finished exterior grades. The footing can be directly supported on competent soils at greater depths or, alternatively, the design footing bearing level can be restored through placement of lean (2,500 psi) concrete or engineered fill materials. If lean concrete is to be used to restore foundation bearing levels, the undercut excavations can be made "neat" with the dimension of the footing. Lean concrete shall conform to Maryland State Highway Mix No. 1. If the design bearing level is restored using engineered fill, however, then the excavation to remove the unsuitable soils shall extend at least 0.5 foot laterally beyond the bottom edge of the footing for each 1 foot of vertical undercut below the footing bearing level. All foundations should be constructed with Type I Portland cement concrete.

5.1.2 Floor Slabs

The on-site natural soils are considered suitable for support of the lowest floor slabs, although moisture control during earthwork operations may be necessary. Based on an assumed finished floor level of about EL 682, it appears that the slabs for the structure will bear on the Stratum I FILL Materials or Stratum II SILT (ML, MH). These materials are likely suitable for the support of a slab-on-grade, however, there may be areas of soft or yielding soils that should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. If highly plastic clay (CH) or silt (MH) soils are encountered at slab subgrades, they should be undercut a minimum of 2 feet and replaced with approved compacted structural fill. When encountered at floor slab subgrade levels, any existing fill should be thoroughly evaluated by the Geotechnical Engineer via test pits, observation of utility excavations, and hand auger borings. The following graphic depicts our soil-supported slab recommendations:

Figure 5.1.2.1



1. Drainage Layer Thickness: 4 inches
2. Drainage Layer Material: GRAVEL (GP, GW)
3. Subgrade compacted to ***98%*** maximum dry density per ASTM D698

Subgrade Modulus: Provided the placement of Structural Fill and Granular Drainage Layer per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 100 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

Slab Isolation: Ground-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and

slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab. Maximum differential settlement of soils supporting interior slabs is anticipated to be less than 1 inch in 40 feet.

5.1.3 Site Retaining Walls

Site retaining walls are often constructed from the "bottom-up" and therefore the type of soil used to backfill the wall is chosen or specified by contract. The lateral earth pressures developed behind site retaining walls is a function of the backfill soil type within an approximate 45-degree angle from the base of the wall upward.

Lateral Earth Pressures: Retaining walls should be designed to withstand the lateral earth pressures exerted by the backfill. The pressure diagram is triangular. It is anticipated that retaining walls associated with the project, will be rigid walls restrained from rotation by a slab. For rigid walls, the "At Rest" (k_o) soil condition should be used in the wall design and evaluation. For walls that are free to deflect at their tops, the "Active" (k_a) soil condition should be used in the wall design and evaluation. In the design of these retaining wall structures, the following soil parameters can be utilized. These parameters assume that Granular Soils meeting the requirements recommended herein for Retaining Wall Backfill will comprise the backfill in the Critical Zone. The Critical Zone is defined as the area between the back of the retaining wall structure and an imaginary line projected upward and rearward from the bottom back edge of the wall footing at a 45-degree angle.

Table 5.1.3.1 Retaining Wall Backfill in the Critical Zone

Soil Parameter	Estimated value
Coefficient of Earth Pressure at Rest (K_o)	0.50
Coefficient of Active Earth Pressure (K_a)	0.34
Retained Soil Moist Unit Weight (γ)	120 pcf
Cohesion (C)	0 psf
Angle of Internal Friction (ϕ)	30°
Friction Coefficient [Concrete on Soil] (μ)	0.35
At-rest Equivalent Fluid Pressure	60H (psf)
Active Equivalent Fluid Pressure	40H (psf)

Table 5.1.3.2 Foundation Soils (Natural Subgrades or On-Site Borrow)

Soil Parameter	Estimated value
Allowable Net Soil Bearing Pressure	3,000 psf
Minimum Wall Embedment Below Grade	30 inches
Coefficient of Passive Earth Pressure (K_p)	2.0
Soil Moist Unit Weight (γ)	120 pcf
Cohesion (C)	100 psf
Interface Friction Angle [Concrete on Soil] (ϕ_f)	18°
Sliding Friction Coefficient [Concrete on Soil] (μ)	0.32
Passive equivalent fluid pressure	240H (psf)

Retaining Wall Backfill: All soils used as backfill within the Critical Zone behind retaining walls should have USCS classifications of Silty SAND (SM) or more granular with a maximum of 35% fines (i.e., % passing No. 200 Sieve size) and minimum angle of internal friction of 30 degrees when compacted to a minimum of 98% of its maximum dry density per ASTM D 698. Any existing soils not meeting these criteria should be removed from the Critical Zone of the walls, as determined by ECS personnel at the time of construction.

Foundation Drains: Retaining walls should be provided with a foundation drainage system to relieve hydrostatic pressures which may develop in the wall backfill. This system should consist of weepholes through the wall and/or a 4-inch perforated, closed joint drain line located along the backside of the walls above the top of the footing. The drain line should be surrounded by a minimum of 6 inches of AASHTO Size No. 57 Stone wrapped with an approved non-woven filter fabric, such as Mirafi 140-N or equivalent.

Wall Drains: All site retaining walls should be drained so that hydrostatic pressures do not build up behind the walls. Wall drains can consist of a 12-inch wide zone of free draining Gravel, such as AASHTO No. 57 Stone, employed directly behind the wall and separated from the soils beyond with a non-woven filter fabric. Alternatively, the wall drain can consist of a suitable geocomposite drainage board material. The wall drain should be hydraulically connected to the foundation drain.

5.1.4 Seismic Design Considerations

Seismic Site Classification: The International Building Code (IBC) 2015 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The latter method (N-value method) was used in classifying this site.

The seismic site class definitions for the weighted average of shear wave velocity or SPT N-value in the upper 100 feet of the soil profile are shown in the following table:

Table 5.1.4.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 50
E	Soft Soil Profile	Vs < 600 fps	<15

Utilizing the data obtained from the on-site boring exploration and our previous experience at neighboring sites, a mean SPT "N"-value between 15 and 50 blows per foot (bpf) is anticipated within 100 feet of the ground surface; therefore, the Seismic Site Class is ***D***.

If it is determined that significant advantage could be gained with an improved Site Class, additional site testing could be performed to measure actual shear wave velocities using ReMi test methods along with a site specific analysis. ECS can provide additional consultation upon request.

Liquefaction: The subsurface profile consists primarily of residual soils derived from the in-place weathering of Metasiltstone rock. The subsurface conditions do not appear to exhibit liquefaction potential; therefore, it is our opinion that additional investigation regarding liquefaction potential is not necessary.

Ground Motion Parameters: In addition to the seismic site classification noted above, ECS has determined the design spectral response acceleration parameters following the IBC 2015 methodology. The Mapped Reponses were estimated from the free Java Ground Motion Parameter Calculator available from the USGS website (http://earthquake.usgs.gov/designmaps/us/application.php). The design responses for the short (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far right end of the following table.

Table 5.1.4.2: Ground Motion Parameters *(IBC 2015 Method)*

Period (sec)	Mapped Spectral Response Accelerations (g)		Values of Site Coefficient for Site Class		Maximum Spectral Response Acceleration Adjusted for Site Class (g)		Design Spectral Response Acceleration (g)	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_S	0.126	F_a	1.6	$S_{MS}=F_aS_s$	0.201	$S_{DS}=2/3\,S_{MS}$	0.134
1.0	S_1	0.052	F_v	2.4	$S_{M1}=F_vS_1$	0.124	$S_{D1}=2/3\,S_{M1}$	0.083

The Site Class definition should not be confused with the Seismic Design Category designation, which the Structural Engineer typically assesses. If a higher site classification is beneficial to the project, ECS would be pleased to discuss additional testing capabilities in this regard.

5.2 SITE DESIGN CONSIDERATIONS

5.2.1 Stormwater Management Facilities

Four (4) in-situ infiltration tests were completed at the site on November 2, 2017. The infiltration test results are shown in Table 5.2.1.1 below and in Appendix B.

Table 5.2.1.1 Infiltration Test Results

Test Location	Approx. Test Depth (ft)	Approx. Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
P-1	6.2	675.8	Loose SILT (ML)	0.09
P-2	5.3	673.7	Loose SILT (ML)	0.18
P-3	5.5	672.5	Medium Dense SILT with Sand (ML)	0.09
SWM-1	5.1	674.9	Loose SILT (ML)	0.00

*Infiltration testing was not performed at SWM-2 and SWM-3 due to fill material being present at and beyond the requested test depth.

The results reported above are based on field measurements. We recommend that the design rate be calculated as 2/3 of the field rate to account for siltation over time.

Based on the results of the infiltration testing, it does not appear that Stormwater Management through infiltration testing will be feasible at this site. The planned SWM facilities should be equipped with underdrains to direct treated runoff to the storm drain system.

5.2.2 Pavement Sections

The proposed parking areas and driveways will be constructed utilizing asphalt pavements. The following sections outline our pavement recommendations.

Subgrade Characteristics: Based on the results of our soil test borings, it appears that the soils that will be exposed as pavement subgrades, exposed in cuts and placed as fill, will consist mainly of silty and clayey natural soil or existing fill material. Highly plastic (CH and MH) soils were encountered in the borings and are likely to be present at pavement subgrades. These highly plastic materials will provide poor pavement support, when encountered, and should be undercut a minimum of 24 inches below subgrade levels and replaced with new compacted structural fill.

Laboratory California Bearing Ratio (CBR) testing was performed on a bulk sample obtained from boring P-1. Based on the results of the laboratory testing, the pavement subgrade soils should exhibit a CBR value of 2 at 97% compaction. The pavement design assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 97 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D 698) in accordance with the project specifications.

Anticipated Vehicular Traffic: Based on review of the provided site plans, the new pavements will be constructed to provide parking and site access for the planned library. It is anticipated that the pavements at this site will be subjected to mostly passenger vehicles with limited heavy truck

traffic. We have assumed a daily traffic volume of 75 vehicles per day with approximately 2% heavy trucks, which equates to approximately 50,000 ESALs over a 20 year design life.

The traffic assumptions outlined above DO NOT account for construction traffic. Construction traffic should be confined to specific stabilized construction roads and not be allowed to degrade the pavement subgrade or new pavement section once it is placed.

Weather Restrictions: In this region, asphalt plants may close during the months of December, January, and/or February if particularly cold weather conditions prevail. However, this can change based on year to year temperature fluctuations. Daily temperatures from December to February will often stay below 40°F, limiting the days that asphalt placement can occur.

5.2.2.1 Asphalt Pavements – Travel Lanes

Based on a maximum traffic load of 50,000 ESALs, and a 20 year design life, we have developed the following asphalt pavement section using the AASHTO 1993 pavement design method.

Table 5.2.2.1 Asphalt Pavement Section

Recommended Pavement Section (50,000 ESALs, CBR=2)	Pavement Thickness (inches)
Bituminous concrete surface course (Typ. 12.5mm Superpave)	2.0
Bituminous base course (Typ. 25.0mm Superpave)	4.0
Graded Aggregate Subbase (GAB)	6.0
Total Pavement Thickness	12.0

All pavement materials and construction should be in accordance with the **Standards and Specifications for Construction Materials**, Maryland Department of Transportation, State Highway Administration, and any Frederick County requirements.

The asphalt pavement section outlined above has been designed based on a minimum California Bearing Ratio (CBR) value of 2 or greater. The pavement design assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 97 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D 698) in accordance with the project specifications. If materials are encountered near the surface that could exhibit a CBR value of less than 2, it is recommended that the upper 24 inches of this subgrade be undercut and replaced with suitable fill material exhibiting a CBR value of 2 or more.

Once the design pavement subgrade elevation is reached, the subgrade should be proofrolled and carefully observed at the time of construction in order to aid in identifying any localized soft or unsuitable materials. Soils which are still unstable after proofrolling will require undercutting and replacement with Engineered Fill. If site work is performed during the wetter winter months, the cohesive and moisture-sensitive subgrade soils subjected to wet conditions and/or ponding water may become unstable and require undercuts and replacement with dryer, suitable material. Exposed subgrade soils should be graded to drain surface moisture and covered as soon as possible with engineered fill compacted in accordance with project requirements.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 SUBGRADE PREPARATION

6.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, building/demolition debris, pavements, and any other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits and to 5 feet beyond the toe of structural fills. ECS should be called on to verify that pavements, building/demolition debris, topsoil and unsuitable surficial materials have been completely removed prior to the placement of Structural Fill or construction of structures.

6.1.2 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be examined by the Geotechnical Engineer or authorized representative. The exposed subgrade should be thoroughly proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the Geotechnical Engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or "pumping" subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning or chemical stabilization, should be discussed with the Geotechnical Engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. A test pit(s) may be excavated to explore the shallow subsurface materials in the area of the instability to help in determined the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

6.1.3 Site Temporary Dewatering

General Groundwater Conditions: Groundwater on this site can generally be characterized as being deeper than the boring depths explored during this study.

Subsurface Water: Based upon our subsurface exploration at this site, as well as significant experience on sites in nearby areas of similar geologic setting, we believe construction dewatering at this site will be limited to mainly removing accumulated rain water and some minor seepage into excavations. It appears permanent static groundwater for this site is below the planned deepest excavation, which is estimated to be less than 10 feet below existing grade.

Deep wells will not be required for the temporary dewatering system. However, the dewatering operations can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches or French drains consisting of free draining granular stone wrapped in filter fabric to direct the flow of water and to remove water from the excavation. If

temporary sump pits are used, we recommend they be established at an elevation 3 to 5 feet below the bottom of the excavation subgrade or bottom of footing. A perforated 55 gallon drum or other temporary structure could be used to house the pump. We recommend continuous dewatering of the excavations using electric pumps or manned gasoline pumps be used during construction.

Details of a typical french drainage installation are included as an attachment to this report. If utilized, the french drain should consist of a filter fabric lined trench filled with No. 57 stone or equivalent open graded stone. A minimum of 4-inch diameter PVC pipe should be placed in the stone bed to enhance water flow. After this installation has been completed, the filter fabric should be wrapped over the top of the gravel and pipe whereupon placement of fill may proceed to grade.

6.1.4 Subgrade Stabilization

Subgrade Benching: Fill should not be placed on ground with a slope steeper than 5H:1V, unless the fill is confined by an opposing slope, such as in a ravine. Otherwise, where steeper slopes exist, the ground should be benched so as to allow for fill placement on a horizontal surface.

Subgrade Compaction: Upon completion of subgrade documentation, the exposed subgrade within the 10-foot expanded building and 5-foot expanded pavement and embankment limits should be moisture conditioned to within -1 and +3 % of the soil's optimum moisture content and be compacted with suitable equipment (minimum 10-ton roller) to a depth of 10 inches. Subgrade compaction within the expanded building, pavement, and embankment limits should be to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper subgrade compaction has been achieved.

Subgrade Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits for buildings, pavements, fills, and slopes, etc. Field density testing of subgrades will be performed at frequencies in Table 6.1.4.1.

Table 6.1.4.1 Frequency of Subgrade Compaction Testing

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft.
Pavement Areas	1 test per 10,000 sq. ft.
Outparcels/SWM Facilities	1 test per 2,500 sq. ft.
All Other Non-Critical Areas	1 test per 10,000 sq. ft.

Subgrade Stabilization: In some areas, undercutting of excessively soft materials may be considered inefficient. In such areas the use of a reinforcing geotextile or geogrid might be employed, under the advisement of ECS. Suitable stabilization materials may include medium duty woven geotextile fabrics or geogrids. The suitability and employment of reinforcing or stabilization products should be determined in the field by ECS personnel, in accordance with project specifications.

6.2 EARTHWORK OPERATIONS

6.2.1 Existing Man-Placed Fill

Fill Content: Fill materials were encountered in seven (7) of the borings and nine (9) of the test pit locations performed at the site. Fill materials are expected in areas of the site that were not explored, as the excavation created during the demolition of the school was backfilled with fill materials. Some of the fill material, which appears to be mainly CR6, contained varying amounts of concrete, asphalt, brick, pipe fragments, plastic and organic material. Based on a review of the fill materials, it appears that these fill materials were placed during the demolition of the previous school and during utility back fill operations.

Fill Stability: Documentation regarding the placement and compaction of these fill materials was not available. Our observations of the fill materials during test pitting operations indicate that the existing fills may not have been well compacted when placed. Additionally, portions of the fills contain deleterious materials (construction debris, organics).

Fill Removal in Non-Building Areas - All undocumented fill deemed unstable via the results of a proofroll should be removed from below the expanded fill removal limits of pavements and Structural Fill embankments. The expanded fill removal limits of pavements and Structural Fill embankments should be defined as that area directly below pavements and Structural Fill embankments, including the reinforced zone of MSE walls, and extending horizontally beyond the edge of these a distance of 1 horizontal foot for every vertical foot of Structural Fill depth above natural subgrade, but not less than 5 feet. ECS personnel should ascertain that fill removal has been suitably accomplished.

Fill Removal in Building Areas - Fill materials are expected within and surrounding the footprint of the proposed building. Any undocumented or unsuitable fill encountered within foundation excavations should be removed per the recommendations provided in Section 5.1.1. Existing fills within planned slab on grade areas should be thoroughly evaluated during construction by the Geotechnical Engineer via proofrolling.

6.2.2 High Plasticity Soils

Cuts: High plasticity soils are those soil materials classified as Elastic SILT (MH) and Fat CLAY (CH). High plasticity soils were encountered in three of the borings at variable depths, and are common within the site geology. Where high plasticity soils are encountered at design subgrade elevations in slab and pavement areas, the subgrade should be undercut 2 feet and grades restored with approved Structural Fill. Where high plasticity soils are encountered at foundation bearing elevations, the foundation excavation should be lowered an additional 2 feet below the design footing subgrade elevation and the design elevation restored by backfilling the excavation with DOT Type 1 Size 21A/CR-6 stone placed and compacted with a vibratory plate compactor in maximum 12-inch lifts or with Flowable Fill having a minimum 28-day compressive strength of 2,000 psi.

Structural Fills: High plasticity soils do not satisfy the specification criteria for satisfactory materials. Given the significant presence of high plasticity soils on this site, and to reduce the amount of import material to the site, the Owner can consider allowing soils with a maximum

Liquid Limit of 60 and maximum Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas.

6.2.3 Decomposed Rock

The excavation of soil and decomposed rock can have a substantial impact on the cost and schedule of the proposed construction. This discussion considers two general classes of materials for purposes of describing excavatability. Residuum and decomposed rock will be used as the terms for the materials to be excavated.

In mass excavations for general site work, overburden soils with standard penetration test N-values of 30 bpf or less can usually be removed with conventional earth excavation equipment such as pans. Residual soils or soft weathered (saprolitic) rock with N-values of 30 to 60 bpf can generally be removed with conventional earth moving equipment after first being loosened with a large single-tooth ripper attached to a large crawler tractor. Very dense and hard soils and more weathered phases of decomposed rock (Stratum III) will generally require the use of a large single-tooth ripper, dozers, and/or track-mounted backhoes for excavation. Typically, decomposed rock which can be penetrated by soil augers (such as those used in this subsurface exploration) can be excavated after being loosened with a large single-tooth ripper. However, materials exhibiting N-values of 50 blows for 1 inch of penetration, typically defined as refusal material, will be more difficult to excavate and generally require blasting and other rock excavation techniques. The actual excavatability of the bedrock material will be greatly controlled by in-situ jointing and bedding and may vary from location to location.

In confined excavations, such as utility trenches, excavation of dense residual soils typically requires the use of large track-mounted backhoes. Excavation of harder phases of decomposed rock (Stratum III) typically requires the use of large track-mounted backhoes, pneumatic spades, or light blasting. Refusal materials (apparent rock) normally require blasting in trench excavations. Blasting in utility trenches must be done carefully to prevent damage to the surrounding materials at the toe of slopes.

Based on boring data obtained during the exploration, we anticipate that materials requiring difficult excavation techniques will generally be below the planned site grading and most of the cuts not in excess of 10 feet. Decomposed rock was encountered in two borings (B-1 and B-2) at a depth of 13.5 feet below existing grades.

6.2.4 Structural Fill Materials

Product Submittals: Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter, debris,

and should contain no particle sizes greater than 4 inches in the largest dimension. Open graded materials, such as Gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable Structural Fill material should have the index properties shown in Table 6.2.4.1.

Table 6.2.4.1 Structural Fill Index Properties

Location with Respect to Final Grade	LL	PI
Building Areas, upper 4 feet	40 max	15 max
Building Areas, below upper 4 feet	50 max	20 max
Pavement Areas, upper 2 feet	40 max	15 max
Pavement Areas, below upper 2 feet	50 max	20 max

Satisfactory Site Retaining Wall Backfill: All soils used as backfill within the Critical Zone behind retaining walls should have USCS classifications of Silty SAND (SM) or more granular with a maximum of 20% fines and minimum angle of internal friction of 32 degrees when compacted to a minimum of 98% of its maximum dry density per ASTM D 698. Any existing soils not meeting these criteria should be removed from the Critical Zone of the walls, as determined by ECS personnel at the time of construction.

Unsatisfactory Materials: Unsatisfactory fill materials include materials which to not satisfy the requirements for suitable materials, as well as topsoil and organic materials (OH, OL), elastic Silt (MH), and high plasticity Clay (CH). The Owner can consider allowing soils with a maximum Liquid Limit of 60 and Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas.

On-Site Borrow Suitability: Based on the results of the soil borings and laboratory testing performed, a majority of the on-site silty (ML) and sandy (SM) soils will be suitable for reuse provided they are conditioned as discussed here. However, laboratory testing indicated that highly plastic (CH and MH) materials were also encountered at the site. These highly plastic soils will not be suitable for reuse.

As indicated on the Laboratory Test Results Summary of Appendix C, a majority of the natural moisture contents of the samples tested were observed to be above 20%. Therefore, moisture conditioning of subgrades and fill lifts is likely to be necessary, especially in the wetter months.

6.2.5 Compaction

Structural Fill Compaction: Structural Fill within the expanded building, pavement, and embankment limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -1 and +3 % of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling

operations should be observed on a full-time basis by a qualified representative of the construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills will be performed at the frequencies shown in Table 6.2.5.1, but not less than 1 test per lift.

Table 6.2.5.1 Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft. per lift
Pavement Areas	1 test per 10,000 sq. ft. per lift
Utility Trenches	1 test per 200 linear ft. per lift
Outparcels/SWM Facilities	1 test per 5,000 sq. ft. per lift
All Other Non-Critical Areas	1 test per 10,000 sq. ft. per lift

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. Sheepsfoot compaction equipment should be suitable for the fine-grained soils (Clays and Silts). A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils. Alternatively, if these soils cannot be stabilized by conventional methods as previously discussed, additional modifications to the subgrade soils such as lime or cement stabilization may be utilized to adjust the moisture content. If lime or cement is utilized to control moisture contents and/or for stabilization, Quick Lime, Calciment® or regular Type 1 cement can be used. The construction testing laboratory should evaluate proposed lime or cement soil modification procedures, such as quantity of additive and mixing and curing procedures, before implementation. The contractor should be required to minimize dusting or implement dust control measures, as required.

Where fill materials will be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts. In confined areas such as utility

trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

6.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1{,}000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete.

Slab Subgrade Verification: A representative of ECS should be called on to observe exposed subgrades within the expanded building limits prior to Structural Fill Placement to assure that adequate subgrade preparation has been achieved. A proofrolling using a drum roller or loaded dump truck should be performed in their presence at that time. Once subgrades have been prepared to the satisfaction of ECS, subgrades should be properly compacted and new Structural Fill can be placed. Existing subgrades to a depth of at least 10 inches and all Structural Fill should be moisture conditioned to within -1/+3 percentage points of optimum moisture content then be compacted to the required density. If there will be a significant time lag between the site grading work and final grading of concrete slab areas prior to the placement of the subbase stone and concrete, a representative of ECS should be called on to verify the condition of the prepared subgrade. Prior to final slab construction, the subgrade may require scarification, moisture conditioning, and re-compaction to restore stable conditions.

6.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrade should be observed and probed for stability by ECS to evaluate the suitability of the materials encountered. Any loose or unsuitable materials

encountered at the utility pipe subgrade elevation should be removed and replaced with suitable compacted Structural Fill or pipe bedding material.

Utility Backfilling: The granular bedding material should be at least 4 inches thick, but not less than that specified by the project drawings and specifications. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill given in this report. Compacted backfill should be free of topsoil, roots, ice, or any other material designated by ECS as unsuitable. The backfill should be moisture conditioned, placed, and compacted in accordance with the recommendations of this report.

Utility Excavation Dewatering: It is possible that perched water may be encountered by utility excavations which extend below existing grades. It is expected that removal of perched water which seeps into excavations could be accomplished by pumping from sumps excavated in the trench bottom and which are backfilled with DOT Size No. 57 Stone or open graded bedding material. Should water conditions beyond the capability of sump pumping be encountered, the contractor should submit a Dewatering Plan in accordance with project specifications.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.5 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

Erosion Control: The surface soils are considered highly erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

7.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS by Noelker & Hull Associates, Inc. and Harris Smariga. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram
Boring Location Diagram
Geologic Map
Soil Survey Map

SITE LOCATION DIAGRAM

MYERSVILLE LIBRARY

NOELKER & HULL ASSOCIATES, INC.
MYERSVILLE MD 21773

ENGINEER	
SCALE	NTS
PROJECT NO.	13:8337
SHEET	1 OF 1
DATE	12/13/2017

LEGEND

APPROX. BORING LOCATION

APPROX. TEST PIT LOCATION

SCALE (IN FEET)

15 30

30 0

N

W E

S

B-1 B-2 B-3

SWM-1 SWM-2 SWM-3

P-1 P-2 P-3

TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11

MYERSVILLE LIBRARY

MYERSVILLE, MD

ECS

BORING LOCATION DIAGRAM

NOELKER & HULL ASSOCIATES, INC.

ECS REVISIONS

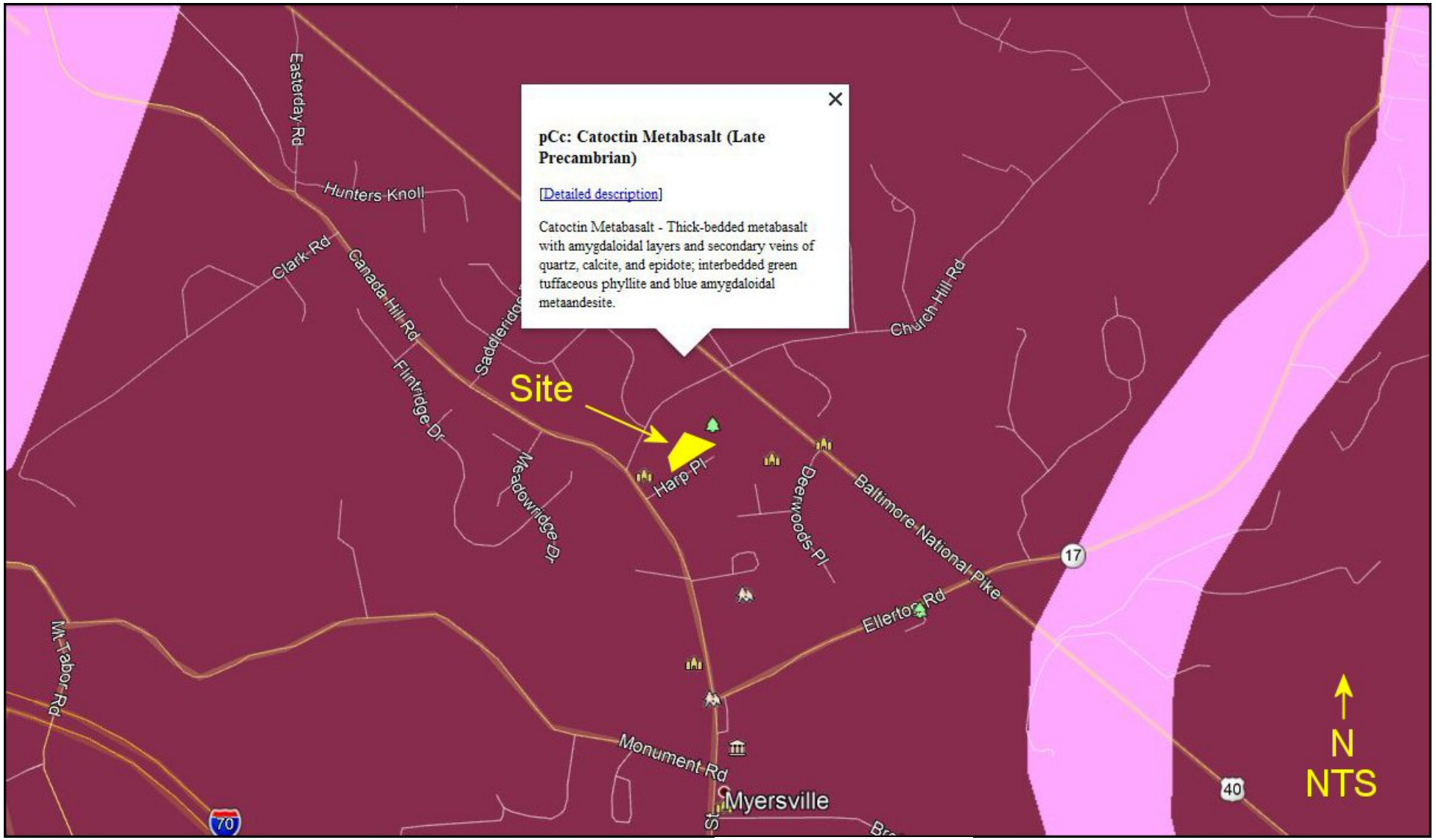
ENGINEER	DRAFTING
GAR	AMH

SCALE 1" = 30'

PROJECT NO. 13-8337

SHEET 1 OF 1

DATE 10/30/17



Geologic map obtained from the Geologic Map of Maryland (1968)

Appendix A – Drawings and Reports **Geologic Map** ECS Project No. 13:8337	ECS LLC MID-ATLANTIC	**Myersville Library** Harp Place Myersville, Frederick County, Maryland

Soil Survey image obtained from USDA – Natural Resources Conservation Service; websoilsurvey.nrcs.usda.gov

Appendix A – Drawings and Reports
Soil Survey Map
ECS Project No. 13:8337

ECS LLC MID-ATLANTIC

Myersville Library
Harp Place
Myersville, Frederick County, Maryland

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Boring Logs (B-1 to B-3, P-1 to P-3, and SWM-1 to SWM-3)
Test Pit Logs (TP-1 to TP-11)
Test Pit Photos
Infiltration Test Results

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL[3] MAN-PLACED SOILS
GW	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GP	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GM	**SILTY GRAVEL** gravel-sand-silt mixtures
GC	**CLAYEY GRAVEL** gravel-sand-clay mixtures
SW	**WELL-GRADED SAND** gravelly sand, little or no fines
SP	**POORLY-GRADED SAND** gravelly sand, little or no fines
SM	**SILTY SAND** sand-silt mixtures
SC	**CLAYEY SAND** sand-clay mixtures
ML	**SILT** non-plastic to medium plasticity
MH	**ELASTIC SILT** high plasticity
CL	**LEAN CLAY** low to medium plasticity
CH	**FAT CLAY** high plasticity
OL	**ORGANIC SILT or CLAY** non-plastic to low plasticity
OH	**ORGANIC SILT or CLAY** high plasticity
PT	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION		**PARTICLE SIZES**
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	**SPT[5] (BPF)**	**CONSISTENCY[7] (COHESIVE)**
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Medium Stiff
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT[5]	**DENSITY**
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15 - 25
Adjective *(ex: "Silty")*	≥25	≥30

WATER LEVELS[6]		
	WL	Water Level (WS)(WD)
		(WS) While Sampling
		(WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09 Note 16.*

[8] *Percentages are estimated to the nearest 5% per ASTM D 2488-09.*

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

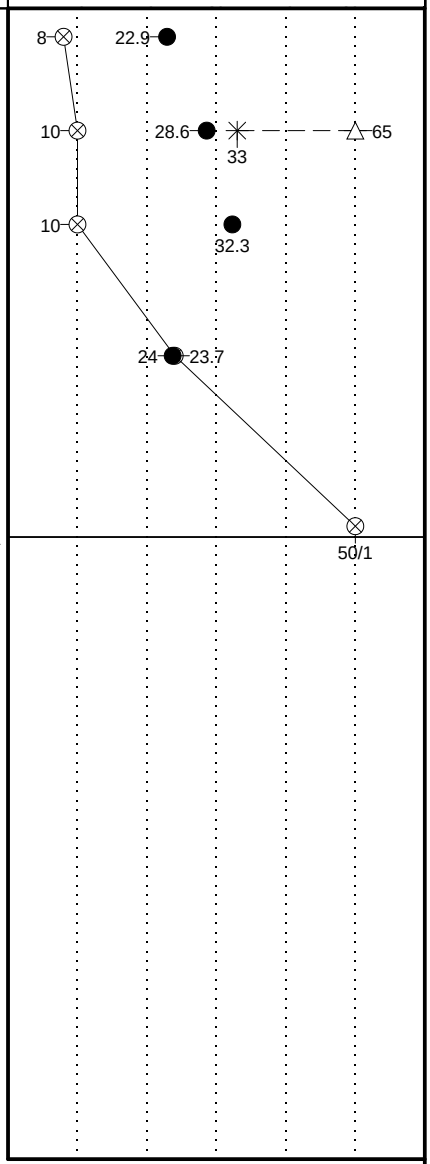
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 681

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	(ML) SILT, trace sand, trace gravel, contains slight roots, brown, moist, loose		680	2 3 5
	S-2	SS	18	18	(MH) ELASTIC SILT, trace gravel, orange, moist, stiff			2 5 5
5	S-3	SS	18	18	(ML) SILT WITH SAND, brownish orange, moist, loose to medium dense		675	3 5 5
	S-4	SS	18	18				7 9 15
10							670	
	S-5	SS	7	7	DECOMPOSED ROCK SAMPLED AS SILT WITH SAND, light brown, moist, very dense [Weathered ROCK]			35 50/1
15					END OF BORING @ 14.08'		665	
20							660	
25							655	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 9.5'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

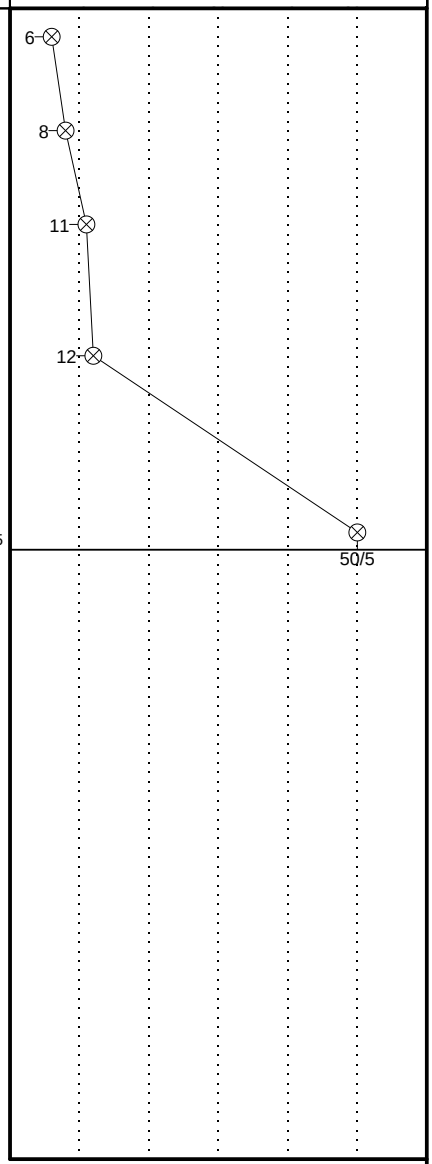
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 681

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Depth [3.00"] (ML/CL FILL) FILL, CLAYEY SILT, trace gravel, brown, moist, firm		680	2 3 3
	S-2	SS	18	18	(ML FILL) FILL, SILT, trace sand, trace clay, contains slight roots brick, light brown, moist, loose			2 3 5
5	S-3	SS	18	18	(ML) SILT, trace clay, trace sand, brownish orange, moist, medium dense		675	3 5 6
	S-4	SS	18	18	(ML) SILT, brownish orange, moist, medium dense			2 5 7
10							670	
	S-5	SS	11	8	DECOMPOSED ROCK SAMPLED AS SILT, brownish orange, moist, very dense [Weathered ROCK]			33 50/5
15					END OF BORING @ 14.42'		665	
20							660	
25							655	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 9.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 681

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0	S-1	SS	18	12		680	1 3 7	10
	S-2	SS	18	18			3 4 6	10
5								
	S-3	SS	18	18		675	4 5 5	10
	S-4	SS	18	18			3 5 6	11
10						670		
	S-5	SS	18	18			3 8 8	16
15						665		
20						660		
25						655		
30								

Topsoil Depth [1.00"]

(GP-GM FILL) FILL, GRAVEL WITH SILT, trace sand, gray, moist, loose

(GP-GM FILL) FILL, GRAVEL WITH SILT, gray, moist, loose to medium dense

(ML) SILT, trace sand, brownish orange, moist, medium dense

END OF BORING @ 15.00'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 10.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	P-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

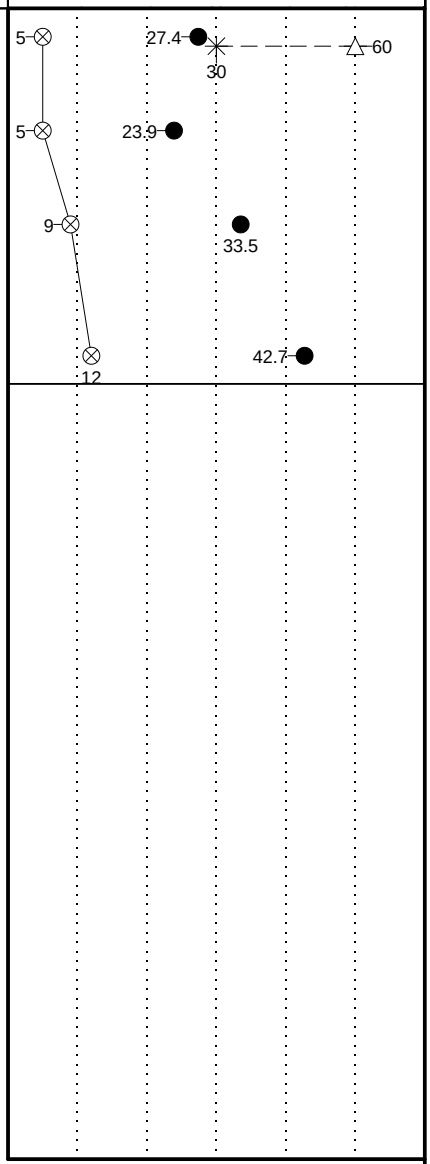
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 682

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1 Bag P-1 1'	SS	18	18	Topsoil Depth [6.00"] (CH) FAT CLAY, contains slight roots, orange, moist, firm		680	2 2 3
	S-2	SS	18	18	(CH) FAT CLAY, trace gravel, contains slight roots, orange, moist, firm			3 2 3
5	S-3	SS	18	18	(ML) SILT, trace clay, light brown, moist, loose to medium dense		675	2 3 6
	S-4	SS	18	18				2 4 8
10					END OF BORING @ 10.00'		670	
15							665	
20							660	
25							655	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 6.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	P-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

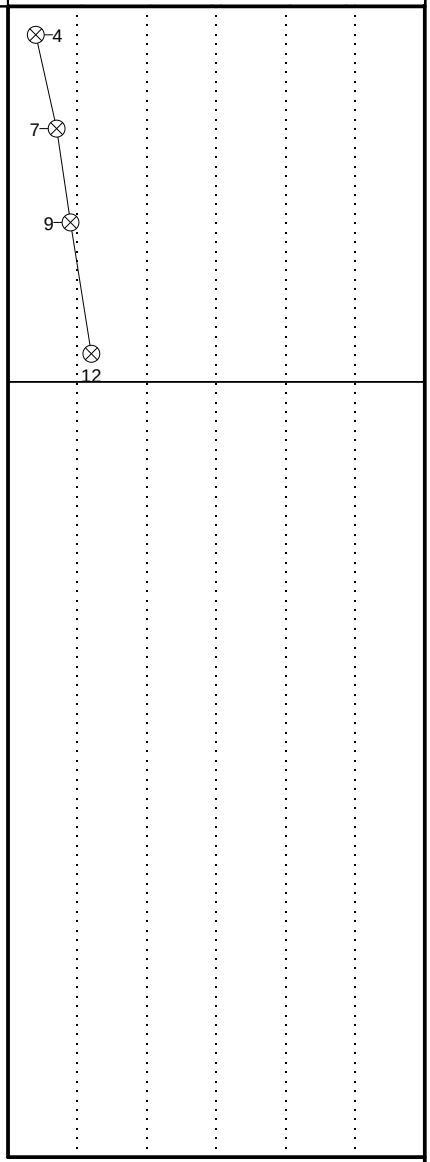
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 679

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Depth [5.00"] (GP-GC FILL) FILL, GRAVEL WITH CLAY, brown, moist, very loose			2 2 2
	S-2	SS	18	18	(ML/CL) CLAYEY SILT, brownish orange, moist, firm		675	2 3 4
5	S-3	SS	18	18	(ML) SILT, orange, moist, loose to medium dense			2 4 5
	S-4	SS	18	18			670	4 4 8
10					END OF BORING @ 10.00'			
15							665	
20							660	
25							655	
30							650	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 6.5'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	P-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

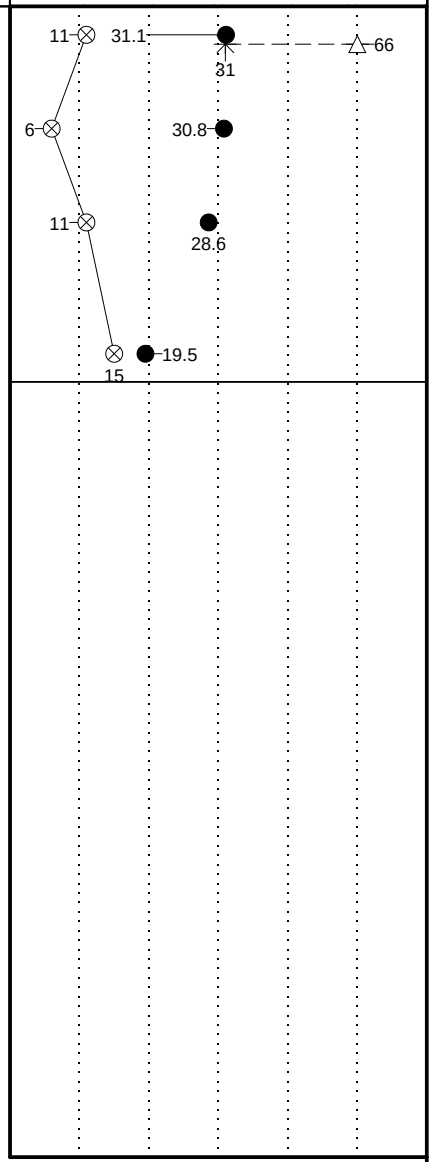
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION (100%)

SURFACE ELEVATION 678

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1 Bag P-3 1'	SS	18	18	Gravel Depth [18.00"]			1 5 6
					(CL/ML FILL) FILL, SILTY CLAY, contains slight roots, brownish orange, moist, stiff			
	S-2	SS	18	18	(CH) FAT CLAY, orange, moist, firm		675	2 3 3
5	S-3	SS	18	18	(ML) SILT WITH SAND, trace gravel, brownish orange, moist, medium dense			3 5 6
							670	
	S-4	SS	18	18	(ML) SILT, trace sand, trace gravel, light brown, moist, medium dense			3 6 9
10					END OF BORING @ 10.00'		665	
15							660	
20							655	
25							650	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 7.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	SWM-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

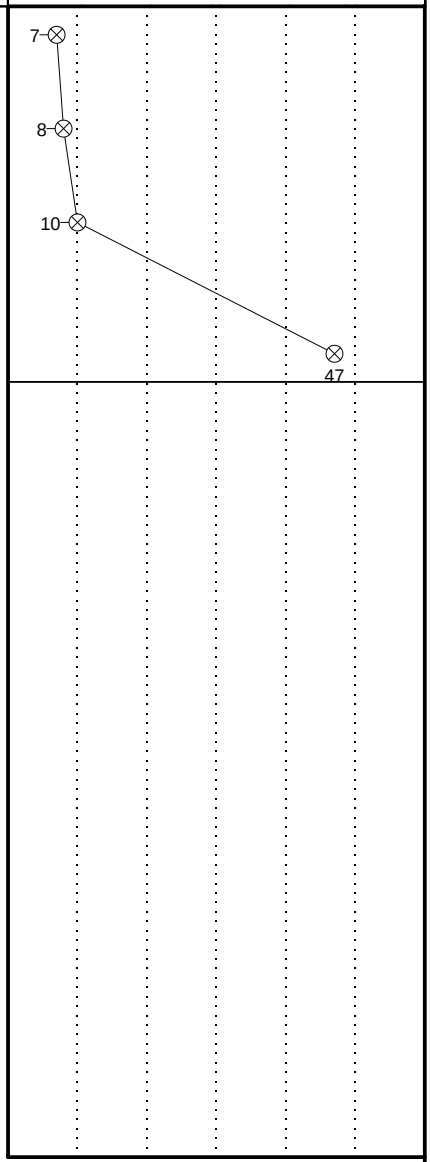
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 680

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Depth [3.00"] (ML FILL) FILL, SILT, trace gravel, trace sand, trace clay, contains slight roots, brown, moist, loose		680	2 3 4
	S-2	SS	18	18	(ML FILL) FILL, SILT, trace sand, trace gravel, brown, moist, loose			3 3 5
5	S-3	SS	18	18	(ML) SILT, brownish orange, moist, loose		675	2 4 6
	S-4	SS	18	18	(ML) SANDY SILT, brownish orange, moist, dense			17 30 17
10					END OF BORING @ 10.00'		670	
15							665	
20							660	
25							655	
30							650	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 5.5'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	SWM-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 680

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Asphalt Depth [4.00"] Gravel Depth [8.00"] (ML FILL) FILL, SILT WITH GRAVEL, trace sand, brown, moist, loose		680	3 4 4
	S-2	SS	18	1	(ML/CL FILL) FILL, CLAYEY SILT, trace gravel, contains roots, brown, moist, loose			5 4 6
5	S-3	SS	18	4			675	4 5 6
	S-4	SS	18	18	(ML) SILT, trace sand, light brown, moist, loose			4 5 5
10					END OF BORING @ 10.00'		670	
15							665	
20							660	
25							655	
30							650	

8 10 11 10

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 6.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

CLIENT	Job #:	BORING #	SHEET
Noelker & Hull Associates, Inc.	13:8337	SWM-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Myersville Library	Noelker & Hull Associates, Inc.

SITE LOCATION: Harp Place, Myersville, Frederick County, MD

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

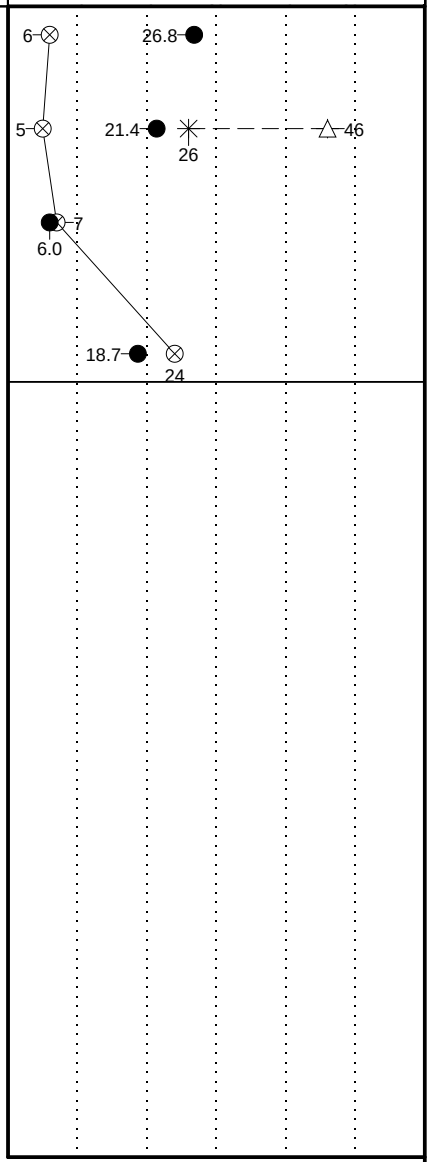
PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 676

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	18	Topsoil Depth [8.00"] (SC FILL) FILL, CLAYEY SAND, trace gravel, brownish orange, moist, loose		675	2 3 3
	S-2	SS	18	18				1 1 4
5	S-3	SS	18	9	(GM FILL) FILL, SILTY GRAVEL, brown, moist, loose		670	3 4 3
	S-4	SS	18	18	(ML) SILT, trace gravel, trace sand, light brown, moist, medium dense			10 12 12
10					END OF BORING @ 10.00'		665	
15							660	
20							655	
25							650	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL Dry WS ☐ WD ☒	BORING STARTED 11/01/17	CAVE IN DEPTH @ 5.0'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 11/01/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Connelly	DRILLING METHOD HSA

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-1
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	682
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0	682	Topsoil Depth [3.00"]	E				
		(ML) SILT, trace gravel, reddish brown, moist, very dense					
2	680		E				
		END OF TEST PIT @ 2.5'					
4	678						
6	676						
8	674						
10	672						
12	670						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-2
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	682
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0	682	Topsoil Depth [2.00"]	E				
		(GP-GM FILL) FILL, GRAVEL WITH SILT, reddish brown, moist, very dense, Contains trace rock on the order of 6"x4"x5"	E				
		(ML FILL) FILL, SILT, trace clay, orange, moist, very dense	E				
2	680	(ML/CL) CLAYEY SILT, brownish orange, moist, very dense	E				
4	678	END OF TEST PIT @ 4'					
6	676						
8	674						
10	672						
12	670						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:			TEST PIT #:
Myersville Library			TP-3
CLIENT:	Job #:		SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337		681
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.		

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [2.00"]	E				
	680	(ML FILL) FILL, SILT, orangish brown, moist, very dense	E				
2		(GP-GM FILL) FILL, GRAVEL WITH SILT And SAND, contains slight concrete brick and construction debris, orangish brown, moist, very dense, The concrete piece was 1'x4"x8" and one of the pipe pieces was 2' long					
	678		M				
4							
	676						
6		(ML) SILT, trace gravel, orange, moist, very dense	M				
	674	END OF TEST PIT @ 7'					
8							
	672						
10							
	670						
12							
	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-4
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	681

DEPTH (FT.)	ELEV. (FT.)	LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
		DESCRIPTION OF MATERIAL						
0		Topsoil Depth [1.00"]		E				
		Asphalt Depth [3.00"]		M				
	680	(ML) GRAVELLY SILT, orange, moist, very dense						
2				E				
	678							
4		END OF TEST PIT @ 4'						
	676							
6								
	674							
8								
	672							
10								
	670							
12								
	668							

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17				

PROJECT NAME:			TEST PIT #:
Myersville Library			TP-5
CLIENT:	Job #:		SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337		681
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.		

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [3.00"]	E				
		(ML FILL) FILL, SILT, contains slight asphalt, orangish brown, moist, very dense	E				
	680	(GP-GM FILL) FILL, GRAVEL WITH SILT, trace clay, contains slight brick, gray, moist, very dense					
2							
	678		E				
4							
	676	(ML) SILT WITH SAND, orange, moist, very dense	E				
		END OF TEST PIT @ 5.5'					
6							
	674						
8							
	672						
10							
	670						
12							
	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:			TEST PIT #:
Myersville Library			TP-6
CLIENT:	Job #:		SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337		680
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.		

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0	680	Topsoil Depth [3.00"]	E				
		(ML FILL) FILL, SILT, contains slight asphalt, orangish brown, moist, very dense	M				
		(GM FILL) FILL, SILTY GRAVEL, gray, moist, very dense					
2	678		M				
		(ML) SILT WITH SAND, orange, moist, very dense	M				
4	676	END OF TEST PIT @ 4'					
6	674						
8	672						
10	670						
12	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-7
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	679
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [8.00"]	E				
	678	(GM FILL) FILL, SILTY GRAVEL, contains slight concrete, gray, moist, very dense, The piece of concrete was 1'x6"x4"	E				
2		(ML) SILT, trace gravel, trace sand, orange, moist, very dense	E				
		END OF TEST PIT @ 2.5'					
	676						
4							
	674						
6							
	672						
8							
	670						
10							
	668						
12							
	666						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-8
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	679
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [8.00"]	E				
	678	(GP-GM FILL) FILL, GRAVEL WITH SILT, gray, moist, very dense	E				
2		(ML) SILT, trace sand, orange, moist, very dense	E				
	676	END OF TEST PIT @ 2.5'					
4							
	674						
6							
	672						
8							
	670						
10							
	668						
12							
	666						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-9
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	680
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0	680	Topsoil Depth [6.00"]	E				
		(ML FILL) FILL, SILT, contains slight wood, brown, moist, very dense, The wood piece was 8" long and 3" in diameter	E				
		(GP-GM FILL) FILL, GRAVEL WITH SILT, contains slight brick, gray, moist, very dense					
2	678		E				
4	676	(ML) SILT, orange, moist, very dense	E				
		END OF TEST PIT @ 5'					
6	674						
8	672						
10	670						
12	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:		TEST PIT #:
Myersville Library		TP-10
CLIENT:	Job #:	SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337	681
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.	

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [3.00"]	E				
	680	(ML FILL) FILL, SILT, brown, moist, very dense	E				
2		(GP-GM FILL) FILL, GRAVEL WITH SILT, contains slight construction debris and brick, gray and orangish brown, moist, very dense, The test pit appears to be at the boundary between the fill material and natural soils					
	678		E				
4							
	676	(ML) SILT, orangish brown, moist, very dense	E				
		END OF TEST PIT @ 5.5'					
6							
	674						
8							
	672						
10							
	670						
12							
	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

PROJECT NAME:			TEST PIT #:
Myersville Library			TP-11
CLIENT:	Job #:		SURFACE ELEVATION
Noelker & Hull Associates, Inc.	13:8337		681
LOCATION: Harp Place, Myersville, Frederick County, MD	ARCH/ENG: Noelker & Hull Associates, Inc.		

DEPTH (FT.)	ELEV. (FT.)	DESCRIPTION OF MATERIAL	EXCAV. EFFORT	DCP	QP (TSF)	SAMPLE NO.	MOIST. CONT. (%)
0		Topsoil Depth [8.00"]	E				
	680	(ML FILL) FILL, SILT, brown, moist, very dense	E				
2		(GP-GM FILL) FILL, GRAVEL WITH SILT, contains slight brick, gray, moist, very dense					
	678		E				
4							
	676	(ML) SILT, trace sand, orange, moist, very dense	E				
		END OF TEST PIT @ 5.5'					
6							
	674						
8							
	672						
10							
	670						
12							
	668						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

GROUND WATER: FIRST CHECK ▽ SECOND CHECK ▼ | EXCAVATION EFFORT: E - EASY M - MEDIUM D - DIFFICULT VD - VERY DIFFICULT

CONTRACTOR:	OPERATOR:	MAKE:
		John Deere
MODEL:	REACH:	CAPACITY:
310J	14	

ECS REP.:	DATE:	UNITS:	Cave-in Depth:	Groundwater While Drilling:	Groundwater:
BAM	11/01/17	ft			

Photo 1 – TP-1 – Showing natural soils at the ground surface

Photo 2 – TP-2 – Rock cobbles encountered in the top 1 foot of the test pit

Photo 3 – TP-2 – Showing 2 feet of fill material underlain by natural soils

Photo 4 – TP-3 – Beginning of excavation and exposing of apparent CR6 material

Photo 5 – TP-3 – Concrete material measuring approximately 1'x8"x4" encountered in test pit

Photo 6 – TP-3 – Pipe (approximately 2 feet in length), brick and concrete material encountered in test pit

Photo 7 – TP-3 – Pipe connection encountered in test pit

Photo 8 – TP-3 – End of test pit showing apparent CR6 underlain by natural soils

Photo 9 – TP-4 – Asphalt material underlain by natural soils

Photo 10 – TP-5 – Trace amounts of asphalt (upper left side of the excavation) and apparent CR6 underlain by natural soils

Photo 11 – TP-6 – Asphalt material and apparent CR6 underlain by natural soils

Photo 12 – TP-7 – Soil and apparent CR6 material underlain by natural soils

Photo 13 – TP-7 – Concrete material encountered in test pit

Photo 14 – TP-9 – Organic material (piece of wood) encountered in test pit

Photo 15 – TP-9 – Apparent CR6 material underlain by natural soils

Photo 16 – TP-10 – Brick encountered in the test pit

Photo 17 – TP-10 – Apparent edge of fill material showing vertical cut filled with CR6

Photo 18 – TP-11 – Excavation of test pit

Photo 19 – TP-11 – Brick material encountered in the test pit

Photo 20 – TP-11 – Apparent CR6 material underlain by natural soils

Test Location	Approximate Test Depth (ft)	Approximate Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
P-1	6.2	675.8	Loose SILT (ML)	0.09
P-2	5.3	673.7	Loose SILT (ML)	0.18
P-3	5.5	672.5	Medium Dense SILT with Sand (ML)	0.09
SWM-1	5.1	674.9	Loose SILT (ML)	0.00

*Infiltration testing was not performed at SWM-2 and SWM-3 due to fill material being present at and beyond the requested test depth.

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary
Plasticity Chart
Grain Size Analysis
Moisture-Density Relationship Curves
CBR Test Results

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-1	0.00 - 1.50	22.9									
	S-2	2.50 - 4.00	28.6	MH	65	33	32	65.2				
	S-3	5.00 - 6.50	32.3									
	S-4	8.50 - 10.00	23.7									
P-1												
	S-1	0.00 - 1.50	27.4									
	Bag P-1 1'	1.00 - 1.00		CH	60	30	30	78.9	96.0	25.6	1.8	
											2.6	
	S-2	2.50 - 4.00	23.9									
	S-3	5.00 - 6.50	33.5									
	S-4	8.50 - 10.00	42.7									
P-3												
	S-1	0.00 - 1.50	31.1									
	Bag P-3 1'	1.00 - 1.00		CH	66	31	35	72.1	104.8	19.5		
	S-2	2.50 - 4.00	30.8									
	S-3	5.00 - 6.50	28.6									
	S-4	8.50 - 10.00	19.5									
SWM-3												
	S-1	0.00 - 1.50	26.8									
	S-2	2.50 - 4.00	21.4	SC	46	26	20	45.7				
	S-3	5.00 - 6.50	6.0									
	S-4	8.50 - 10.00	18.7									

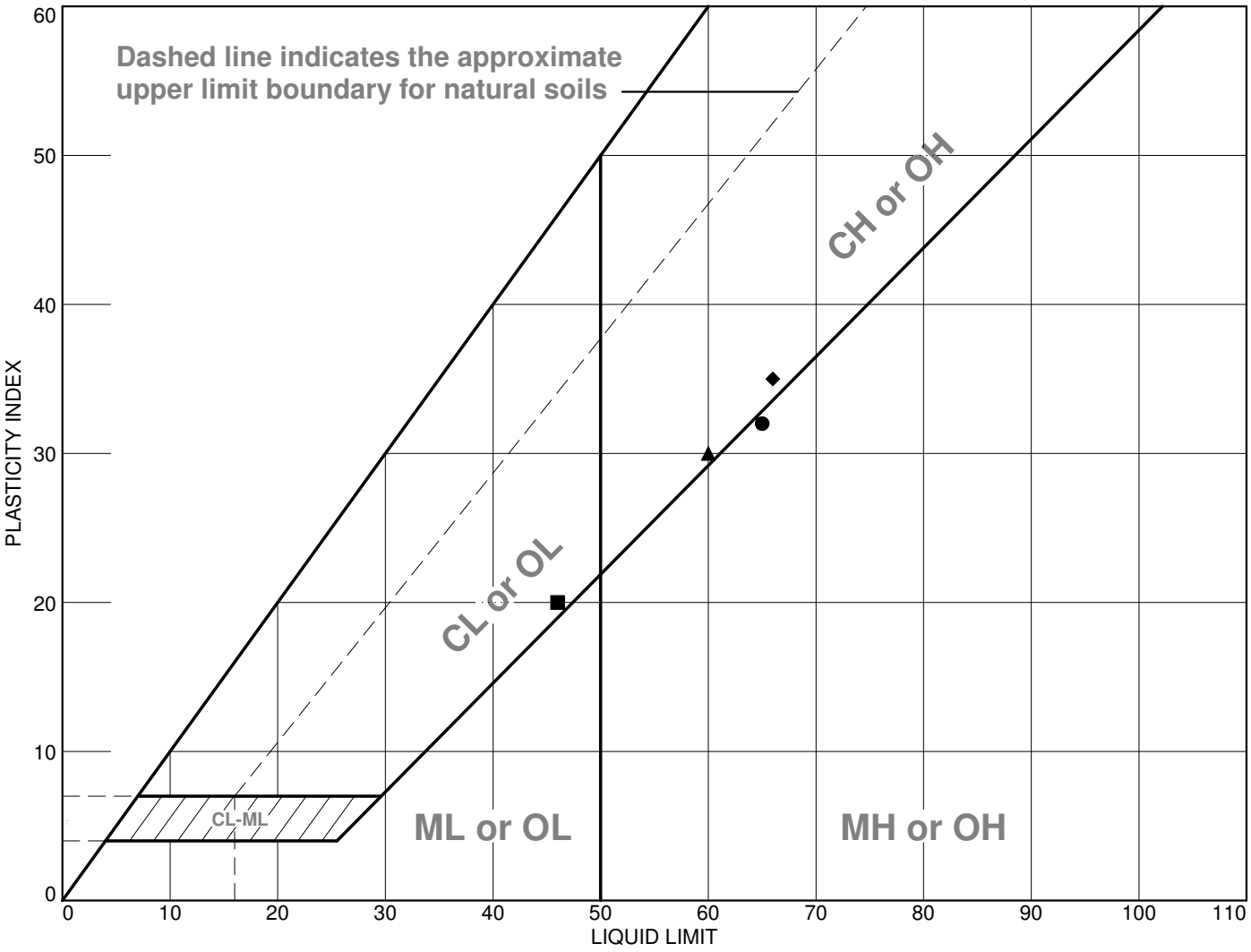
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No.	**13:8337**
Project Name:	**Myersville Library**
PM:	**Greg Ratkowski**
PE:	**Jeff McGregor**
Printed On:	**Monday, December 04, 2017**

ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Orange Sandy ELASTIC SILT	65	33	32	75.6	65.2	MH
■	Brownish Orange Clayey SAND	46	26	20	57.3	45.7	SC
▲	Orange FAT CLAY w/Sand	60	30	30	86.4	78.9	CH
◆	Orange FAT CLAY w/Sand	66	31	35	80.6	72.1	CH

Project No. 8337 **Client:** Noelker & Hull Associates, Inc.

Project: Myersville Library

● **Source of Sample:** B-1 **Depth:** 2.50-4.00 **Sample Number:** S-2

■ **Source of Sample:** SWM-3 **Depth:** 2.50-4.00 **Sample Number:** S-2

▲ **Source:** P-1 **Depth:** 1.00-4.00 **Sample No.:** Bag P-1 1'

◆ **Source:** P-3 **Depth:** 1.00-4.00 **Sample No.:** Bag P-3 1'

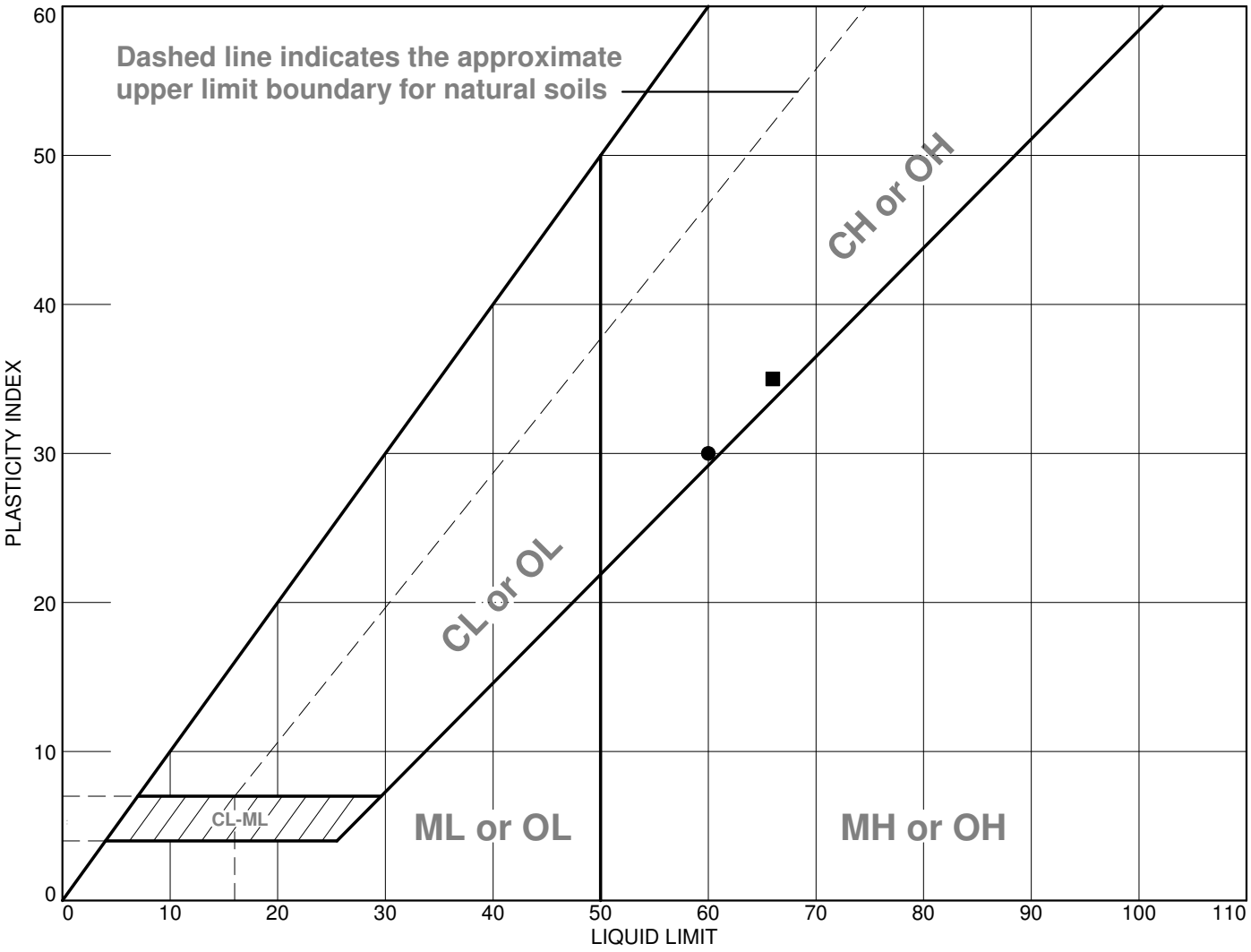
Remarks:

ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

Figure

Tested By: PK **Checked By:** PK

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Orange FAT CLAY w/Sand	60	30	30	86.4	78.9	CH
■	Orange FAT CLAY w/Sand	66	31	35	80.6	72.1	CH

Project No. 8337 **Client:** Noelker & Hull Associates, Inc.

Project: Myersville Library

● **Source:** P-1 **Depth:** 1.00-4.00 **Sample No.:** Bag P-1 1'

■ **Source:** P-3 **Depth:** 1.00-4.00 **Sample No.:** Bag P-3 1'

Remarks:

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Frederick, MD 21704
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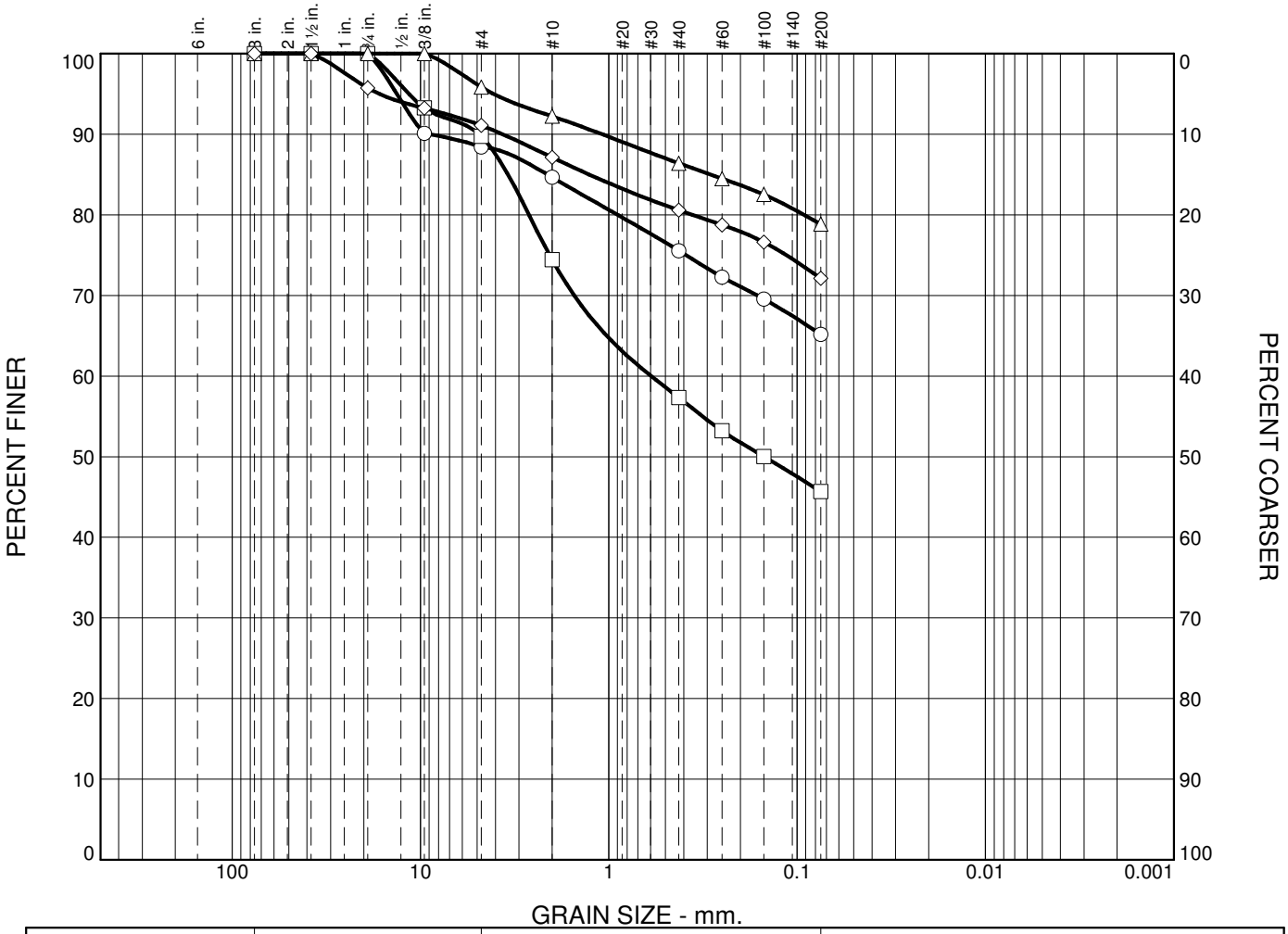
Figure

Tested By: PK **Checked By:** PK

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	11.6	3.7	9.1	10.4	65.2	
□	0.0	0.0	10.3	15.2	17.2	11.6	45.7	
△	0.0	0.0	4.1	3.7	5.8	7.5	78.9	
◇	0.0	4.3	4.6	4.0	6.5	8.5	72.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1	S-2	2.50-4.00	Orange Sandy ELASTIC SILT	MH
□	SWM-3	S-2	2.50-4.00	Brownish Orange Clayey SAND	SC
△	P-1	Bag P-1 1'	1.00-4.00	Orange FAT CLAY w/Sand	CH
◇	P-3	Bag P-3 1'	1.00-4.00	Orange FAT CLAY w/Sand	CH

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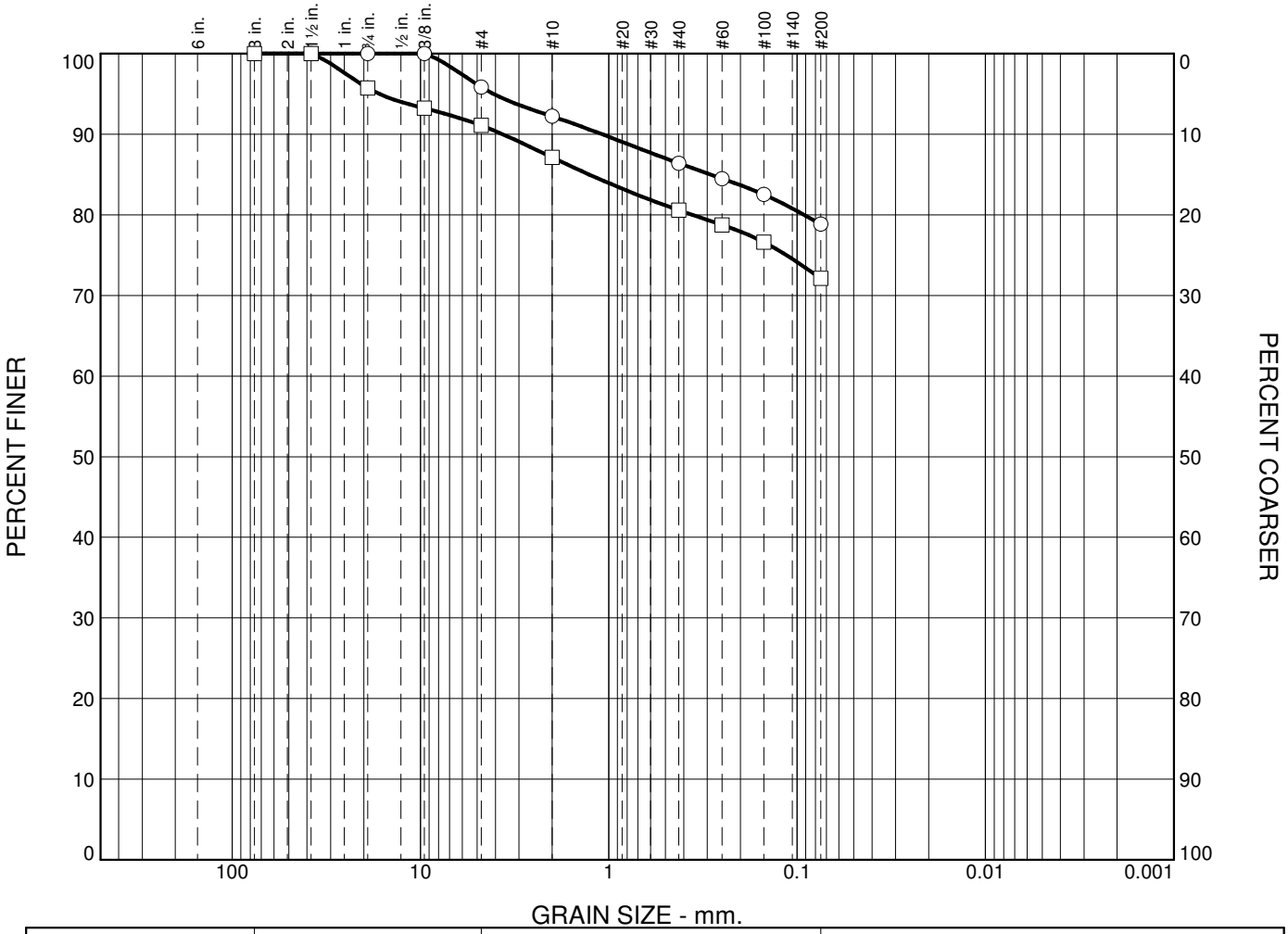
Client: Noelker & Hull Associates, Inc.

Project: Myersville Library

Project No.: 8337 **Figure**

Tested By: PK **Checked By:** PK

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.1	3.7	5.8	7.5	78.9	
□	0.0	4.3	4.6	4.0	6.5	8.5	72.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	P-1	Bag P-1 1'	1.00-4.00	Orange FAT CLAY w/Sand	CH
□	P-3	Bag P-3 1'	1.00-4.00	Orange FAT CLAY w/Sand	CH

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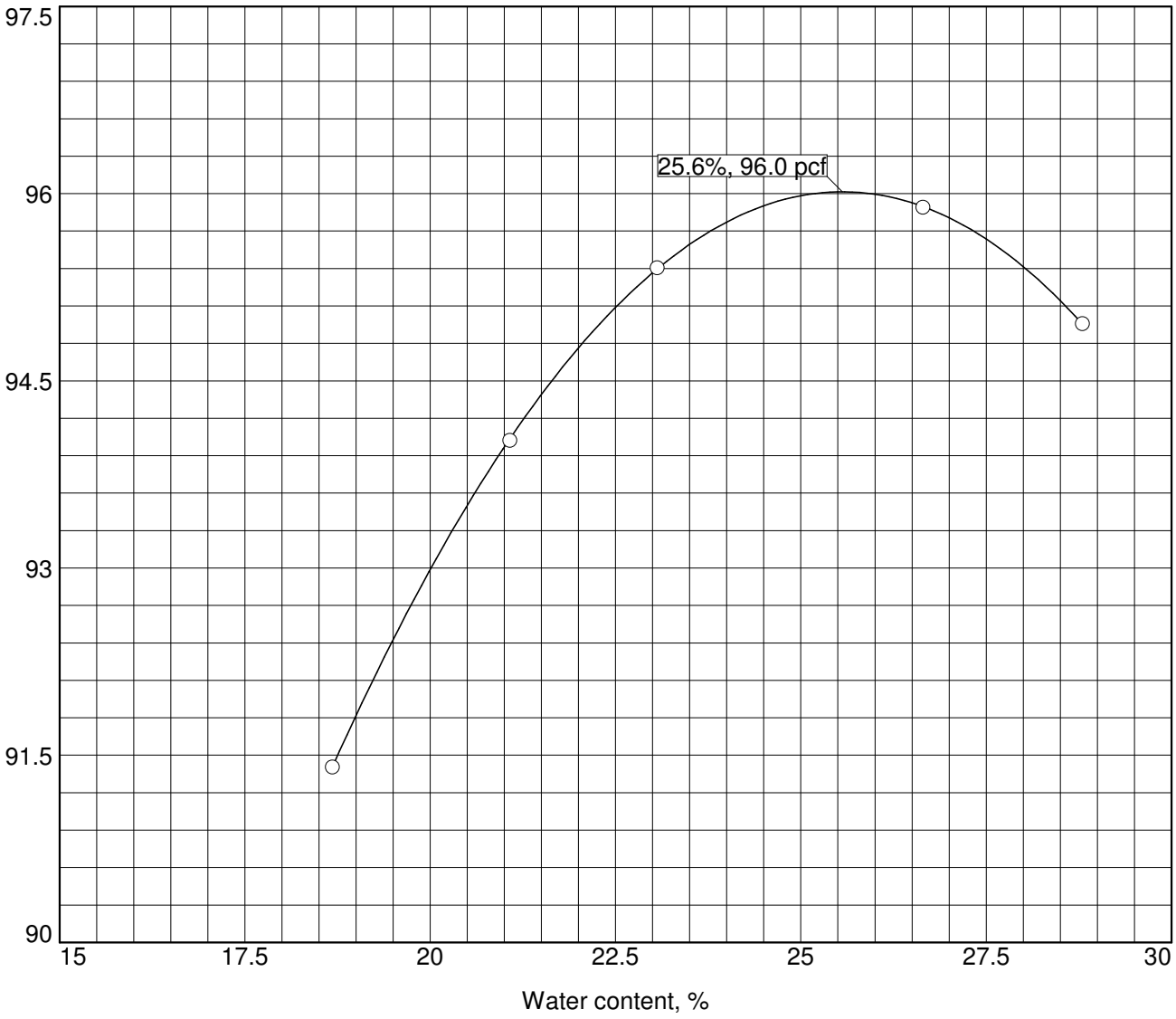
Fax: (301) 668-3519

Client: Noelker & Hull Associates, Inc.

Project: Myersville Library

Project No.: 8337 **Figure**

Tested By: PK **Checked By:** PK



Test specification: AASHTO T 99-15 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.00-4.00	CH	A-7-5(26)			60	30	0.0	78.9

TEST RESULTS

Maximum dry density = 96.0 pcf

Optimum moisture = 25.6 %

MATERIAL DESCRIPTION

Orange FAT CLAY w/Sand

Project No. 8337 **Client:** Noelker & Hull Associates, Inc.

Project: Myersville Library

Date:

○ **Source of Sample:** P-1 **Sample Number:** Bag P-1 1'

Remarks:

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Frederick, MD 21704
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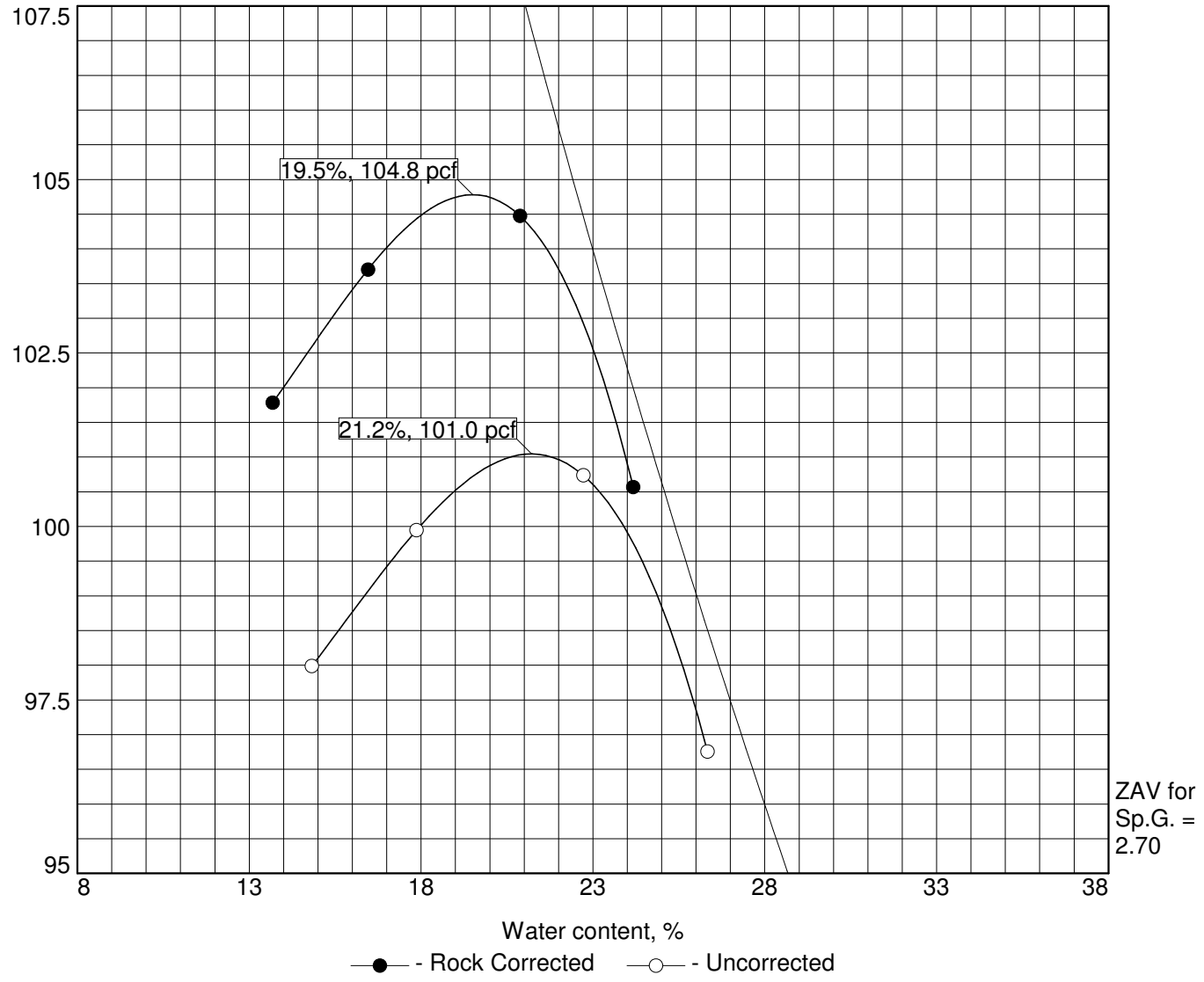
Figure

Tested By: PK **Checked By:** PK

COMPACTION TEST REPORT For Curve No. P-3/Bag P-3



Test specification: ASTM D 698-12 Method A Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
1.00-4.00	CH	A-7-5(26)		2.7	66	35	8.9	72.1

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 104.8 pcf	101.0 pcf	Orange FAT CLAY w/Sand
Optimum moisture = 19.5 %	21.2 %	

Project No. 8337 **Client:** Noelker & Hull Associates, Inc.

Project: Myersville Library

Date: 11/30/

○ **Source of Sample:** P-3 **Sample Number:** Bag P-3 1'

Remarks:

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Frederick, MD 21704
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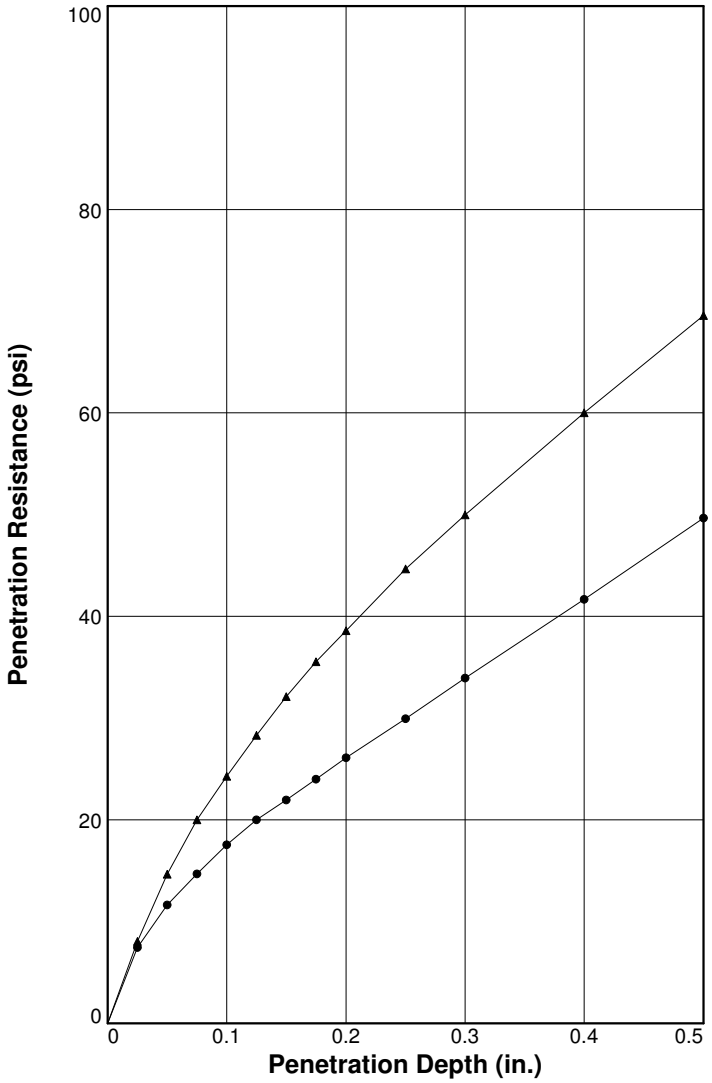
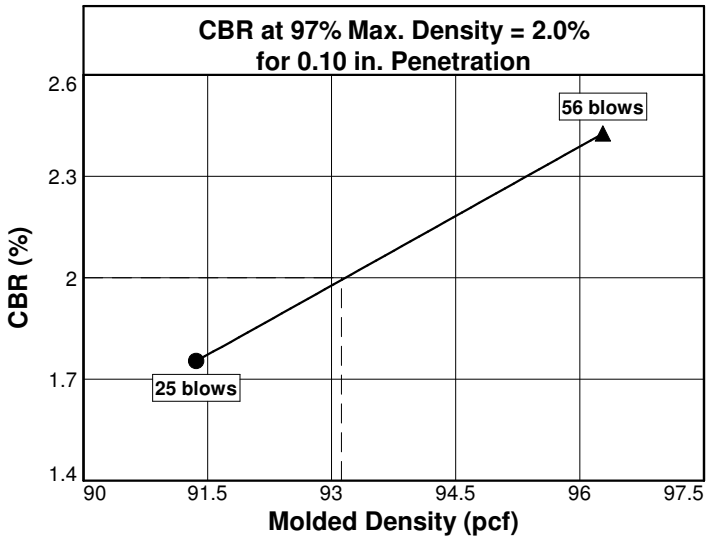
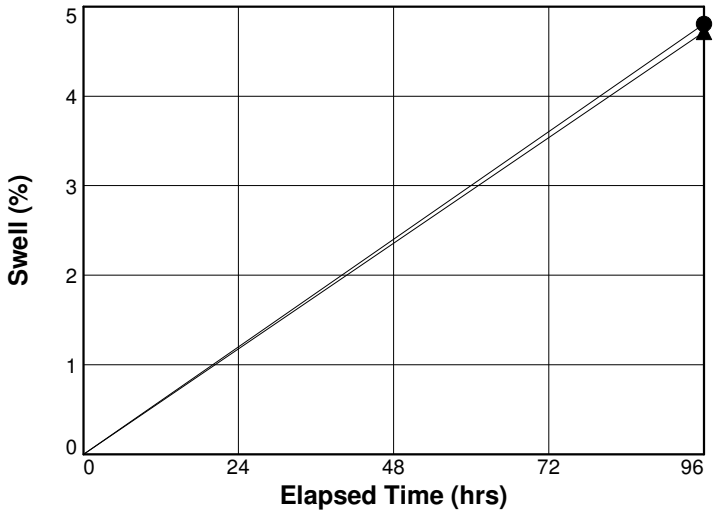
Figure

Tested By: PK **Checked By:** PK

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	91.4	95.2	25.1	87.2	90.8	39.8	1.8	1.7	0.000	10	4.8
2 △	96.3	100.3	25.1	91.9	95.8	37.1	2.4	2.6	0.000	10	4.7
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Orange FAT CLAY w/Sand	CH	96.0	25.6	60	30

Project No: 8337

Project: Myersville Library

Source of Sample: P-1 **Depth:** 1.00-4.00

Sample Number: Bag P-1 1'

Date:

ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

Test Description/Remarks:

Figure P-1/Bag P-1

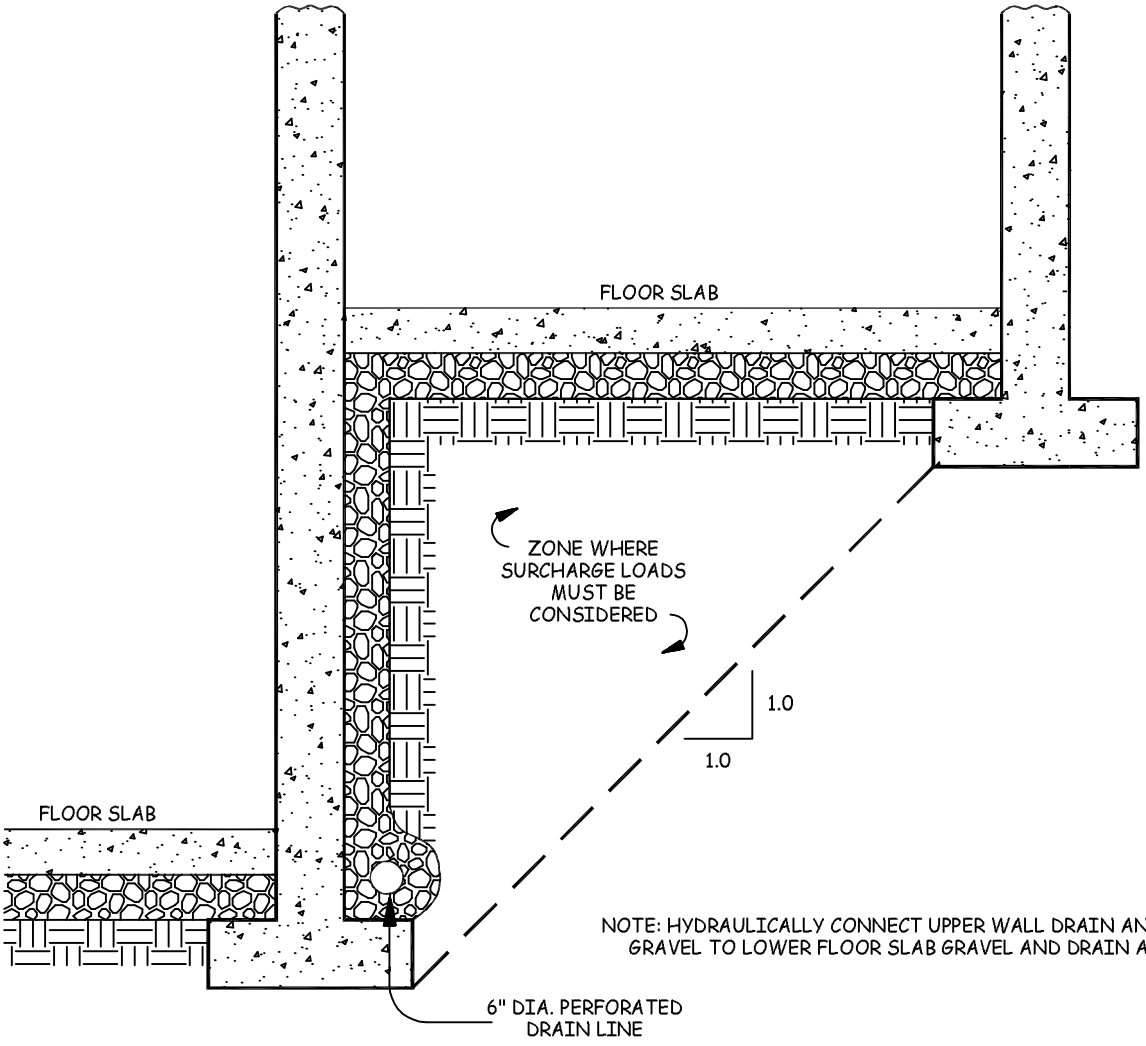
APPENDIX D – Supplemental Report Documents

Zone of Influence Diagram
French Drain Installation Procedure

ZONE OF INFLUENCE DIAGRAM

(INTERIOR WALLS)

NOT TO SCALE



NOTE: HYDRAULICALLY CONNECT UPPER WALL DRAIN AND UNDERSLAB GRAVEL TO LOWER FLOOR SLAB GRAVEL AND DRAIN AS SHOWN.

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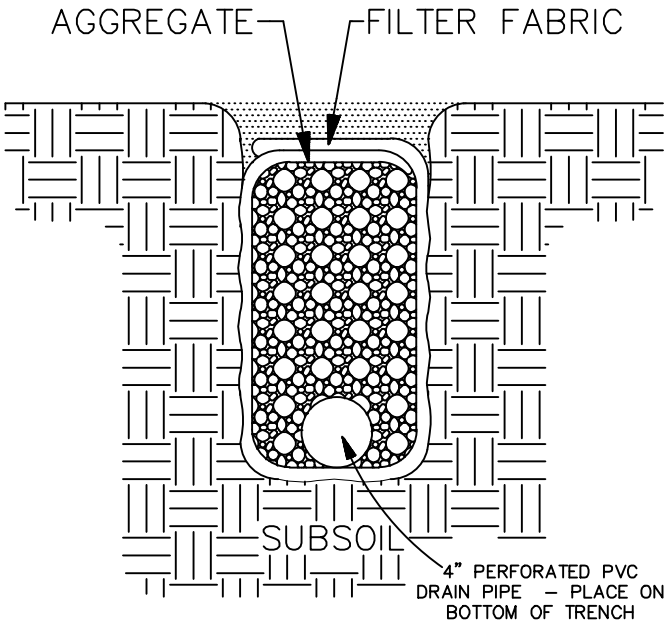
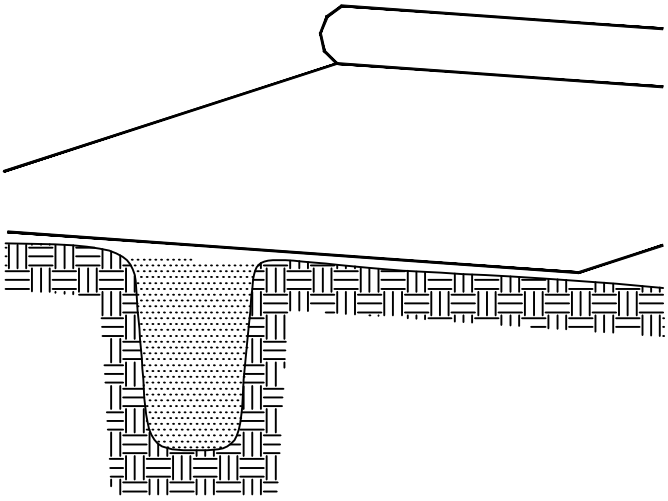
FINAL CONFIGURATION



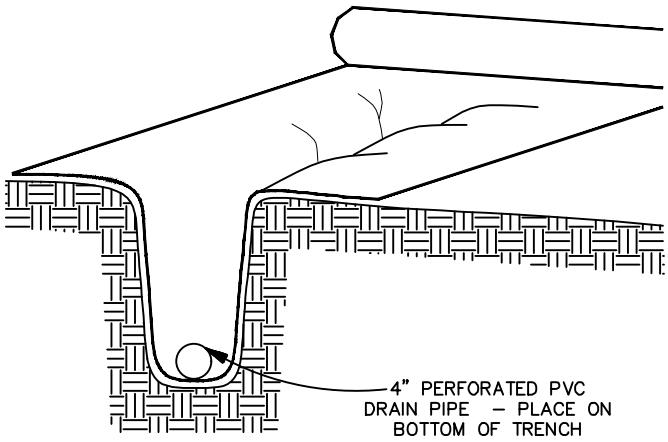
SUBDRAIN USING FILTER FABRIC

STEP 1



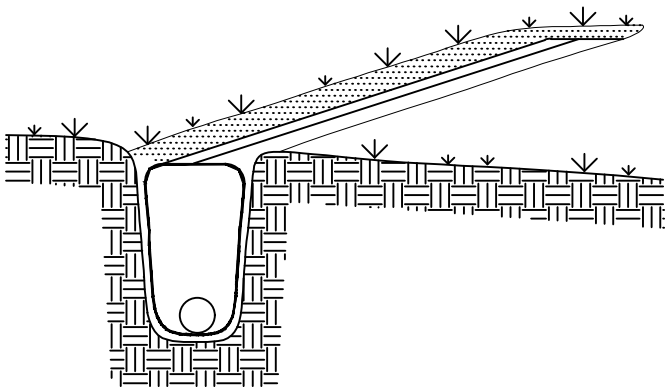
FABRIC IS UNROLLED
DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED
WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED
AND COVERED WITH SOIL

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MID-ATLANTIC

FRENCH DRAIN
INSTALLATION PROCEDURE

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I, gray.
2. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M and potable.

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

B. Cementitious Materials: Use fly ash as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/c ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete (Not exposed to weathering):

1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

B. Normal-Weight Concrete (Exposed to weathering):

1. Minimum Compressive Strength: 4500 psi (31 MPa) <**Insert strength**> at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

C. Suspended Slabs: Normal-weight concrete.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Normal weight.

C. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Normal weight.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

F. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
1. Exterior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
5. Provide in lengths of not less than 10 feet (3 m).

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

2.5 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type M.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

3.4 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 12.67 ft. (3.86 m).

3.7 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.8 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Mill test reports for structural steel, including chemical and physical properties.

C. Source quality-control reports.

D. Field quality-control and special inspection reports.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Allowable Stress Design; data are given at service-load level.
3. Steel shop drawings and connection calculations are delegated design. Connection calculations shall be signed and sealed by a registered professional engineer in the local jurisdiction. Include a certificate of proof of professional liability insurance.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Combined system of moment frame and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 36, ASTM F 1554, Grade 55, weldable.

1. Configuration: Straight.
2. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, ASTM F 1554, Grade 55, weldable, straight.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

F. Threaded Rods: ASTM A 36/A 36M, ASTM A 193/A 193M, Grade B7.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.4 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened and Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Evaluation reports.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

2. Deck Profile: Type IR, intermediate rib.
3. Profile Depth: 1-1/2 inches (38 mm).
4. Design Uncoated-Steel Thickness: As indicated.

2.3 NONCOMPOSITE FORM DECK

A. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 45, G60 (Z180) zinc coating.

2. Profile Depth: 9/16 inch (14 mm).
3. Design Uncoated-Steel Thickness: 0.0358 inch (0.91 mm).

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

G. Galvanizing Repair Paint: ASTM A 780/A 780M.

H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

G. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld.

H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

I. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

J. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

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. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal For Shop Drawings and Calculations: For cold-formed steel framing including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional engineer to submit a certificate of proof of professional liability insurance.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product.
1. Power-actuated anchors.
2. Mechanical fasteners.

3. Vertical deflection clips.
4. Horizontal drift deflection clips
5. Miscellaneous structural clips and accessories.

E. Evaluation Reports: For nonstandard cold-formed steel framing and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. ClarkDietrich Building Systems.
2. MarinoWARE.
3. Nuconsteel, A Nucor Company.
4. Southeastern Stud & Components, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 1/600 of the wall height.
   b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
   c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 1/600 of the wall height.
   d. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
   e. Floor Joist Framing: Vertical deflection of 1/360 for live loads and l/240 for total loads of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch (13 mm).
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: As required by structural performance.
2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZM150), or GF30 (ZGF90).

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G60 (Z180).

2.4 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm). (Minimum)

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-1/4 inches (32 mm). (Minimum)

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm). (Minimum)

D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
   2. Top Flange Width: 1-5/8 inches (41 mm). (Minimum)

2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
   2. Flange Width: 1-5/8 inches (41 mm). (Minimum)

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
   2. Flange Width: 1-1/4 inches (32 mm). (Minimum)

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
   2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
      b. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
      b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch (25 mm).

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).

2. Flange Width: 1-3/8 inches (35 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
a. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
b. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
2. Inner Track: Of web depth indicated, and as follows:
a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch (25 mm).

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.7 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.

2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
1. Uses: Securing cold-formed steel framing to structure.
2. Type: adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M or SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
   1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch (3 mm) between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically 48 inches (1220 mm). Fasten at each stud intersection. Use one of the following bridging systems throughout.
1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
   4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
   1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to studs and anchor to building structure.
   4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection. Use one of the following bridging systems throughout.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
   1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.7 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

A. Touch up installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Metal ladders.
3. Miscellaneous steel trim.
4. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Prefabricated building columns.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.

D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 3/4-inch- (19-mm-) diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung.
6. Prime ladders, including brackets and fasteners, with universal shop primer.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.

B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.

C. Prime bollards with zinc-rich primer.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning " and below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink grout.

C. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055136 - ALTERNATING TREAD STEEL STAIRS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Fabricate and Install metal alternating tread stair assemblies in accordance with the requirements set forth in this section.

1.2 ADDITIONAL WORK INCLUDED IN THIS SECTION

A. Field measurements of alternating tread stair installation sites and verification of vertical distance between floors.

1.3 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.4 SUMMARY:

A. Provide all material, labor, equipment and services and perform all operations necessary or required for the work of this section, in accordance with the Drawings and Specifications, and including fabrication and installation of alternating tread steel stairs.

B. Related work specified elsewhere includes but is not limited to:

1. Conventional Metal Stairs in another Division 5 section
2. Metal Fabrications in another Division 5 section
3. Painting in Division 9

1.5 PERFORMANCE REQUIREMENTS:

A. Alternating Tread Stair Treads: shall be capable of withstanding a single concentrated 1000 pound load without permanent deformation; or 100 pounds per square foot or 300 pounds on an area of 4 square inches without exceeding the allowable working stress of the material.

B. Alternating Tread Stair Guard/Handrail: shall be capable of withstanding a single concentrated load of 200 pounds or a uniform load of 50 pounds per linear foot applied in any direction at any point on the rail without exceeding the allowable working stress of the material.

C. Alternating Tread Stair Stringers: shall be capable of withstanding a single concentrated load of 1000 pounds at any point on the stair without permanent deformation; or a uniform live loading

of 100 pounds per square foot applied in a downward direction to all tread surfaces or a 300 pound load on an area of 4 square inches without exceeding the allowable working stress of the material.

1.6 CONSTRUCTION REQUIREMENTS:

A. Landings, Treads, and Mounting Base: shall be stamped and formed from single piece material. Stock shapes, hand forming, or welded remnants shall not be permitted. All stamped parts shall have integrally formed rigidizing bends and shall be spot welded to stringers of like material.

B. Welds: shall be a minimum of 6 welds per tread, and 12 welds each on the landing and mounting base. Each weld shall be quality controlled and be capable of withstanding a minimum of 2800 lbs. in shear.

C. Pedestrian Surfaces: shall be punched through with upset non-skid openings.

D. Riser Spacing: shall be equally spaced to within 3/16" for adjacent risers and to within 3/8" for any two non-adjacent risers on a stair.

E. Guards and Handrails: shall be contoured for body guidance and underarm support and shall be attached to the outside stringers and landings by bolting.

F. Landing Reinforcement: shall be with 1/4" steel angle notched and punched and factory welded to the landing at the points of a guard or handrail attachment.

G. Rubber Foot Divider: shall be affixed to the central portion of the landing. A rubber bumper strip shall be attached or will be provided for field attaching to the central stringer.

1.7 DIMENSIONS:

A. Alternating Tread Stair Angle: 56 or 68 degrees from horizontal as specified in the drawings.

B. Vertical Drop: the change in elevation, as shown in the drawings, between the upper finished floor surface where the top landing will be attached and the lower finished floor surface where the base of the alternating tread stair will be secured.

1.10 SUBMITTALS:

A. Product Data for Alternating Stair.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.11 DELIVERY STORAGE AND HANDLING

A. Deliver materials to the job-site in good condition and properly protected against damage to finished surfaces.
B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending can not occur.
C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.
D. Plan work and storage locations to keep on-site handling to a minimum.
E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURER:

A. Lapeyre Stair, Inc.
5117 Toler St.
Harahan, LA. 70123;
1-(800)-535-7631 or
1-(504)-570-6209.

B. Substitutions will not be considered.

2.2 MATERIALS:

A. Carbon Steel:
1. Treads: 13 Gauge AISI 1010/15 HRPO per ASTM A569 / A1011 grade 36 (or higher).
2. Landing & Foot Stampings: 11 Gauge AISI 1010/15 per ASTM A569 / A1011 grade 36 (or higher).
3. Top Landing Support Clips: L2 x 2 x ¼” x 4” lg. with 5/8” Φ round holes and 5/8” x 1” slot holes, ASTM A569/A1011 grade 36 (or higher)
4. Stringers:
a. 2" x 1 3/4" x 11 Gauge U section; AISI 1010/15 per ASTM A569/A1011 grade 36 (or higher) for 56 degree stairs under 10 vertical feet and for 68 degree stairs under 12 vertical feet.
b. 3" x 1 3/4" x 11 Gauge U section; AISI 1010/15 per ASTM A569/A1011 grade 36 or higher for 56 degree stairs over 10 vertical feet and for 68 degree stairs over 12 vertical feet.
5. Handrails: 1 1/2" OD x 0.083" AISI 1010/15 CS per ASTM A569/A1011 cold drawn, fully annealed tube per ASTM A513 grade 1008 or higher As-welded tubing or ASTM A500 Grade B.

2.3 FINISHES:

A. Carbon Steel:
    1. Safety Yellow Paint: Powder Coat Baked Enamel

2.4 FABRICATION:

A. General: Fabricate alternating tread steel stairs to conform with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.

B. Carbon Steel: gas metal arc welded with treads spot welded to stringers and bolt-on handrails with included bolts using the specified materials.

PART 3- EXECUTION:

3.1 PREPARATIONS:

A. Coordination: Coordinate start and installation of steel alternating tread stair with all other related and adjacent work. Installation shall not start until the construction has progressed to the point that weather conditions and remaining construction operations will not damage alternating tread stair installation.

B. Verification: Verify that dimensions and angle are correct and that substrate is in proper condition for alternating tread stair installation. Do not proceed with installation until all necessary corrections have been made.

3.2 INSTALLATION:

A. If bumper has not been installed at the factory, install the bumper in accordance with the manufacturer's instructions using glue supplied with the alternating tread stair.

B. Prepare mounting holes.

C. Position alternating tread stair with top tread at same elevation as upper finished floor or roof surface.

D. Secure alternating tread stair with not less than 2 bolts or studs at top and with not less than 2 at bottom of stair.

E. Touch up with matching paint any chipped or abraded damage to factory finish or

F. Touch up any damage to galvanized surfaces using galvanized repair paint in accordance with ASTM A780.

3.3 CLEAN-UP:

A. Leave work area clean and free of debris.

B. On completion of installation, clean exposed surfaces as recommended by manufacturer.

END OF SECTION 055136

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood blocking and nailers.
   2. Wood sleepers.
   3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M .

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. ICC-ES evaluation report for fastener.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Composite nail base insulated roof sheathing.
4. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

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. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
   b. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
   c. USG Corporation; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.

2.2 ROOF SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

2.3 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type V with DOC PS 2, Exposure 1 oriented strand board on one face.

1. Products: Subject to compliance with requirements, provide products by one of the following:

   a. Atlas EPS; a Division of Atlas Roofing Corporation;.
   b. Dow Chemical Company (The);.
   c. Johns Manville; a Berkshire Hathaway company;.
   d. Rmax, Inc;.

2. Polyisocyanurate-Foam Thickness: 2-1/2 inches (64 mm), with second layer of 2-1/2" polyisocyanurate to make up required R-value.
3. Oriented-Strand-Board Nominal Thickness: 7/16 inch (11.1 mm).

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood girder trusses.

1.2 ALLOWANCES

A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

1.3 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated-Design Submittal for shop drawings and calculations: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional engineer to submit a certificate of proof of professional liability insurance.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.5 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1.

B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. Allowable design loads, as published by manufacturer, shall comply with or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.6 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061000 "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior trim.

1.2 DEFINITIONS

A. MDO: Plywood with a medium-density overlay on the face.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Softwood Plywood: DOC PS 1.

C. Hardboard: ANSI A135.4.

2.2 INTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Eastern white pine; NeLMA or NLGA D Select.
2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NLGA or WWPA D Select (Quality).

3. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA D Select (Quality).
4. Species and Grade: White woods; WWPA D Select.
5. Species and Grade: Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA Superior or C & Btr finish.
6. Species and Grade: Spruce-pine-fir; NeLMA, NLGA, WCLIB, or WWPA 1 Common.
7. Maximum Moisture Content: 19 percent.
8. Finger Jointing: Not allowed.
9. Face Surface: Surfaced (smooth).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

D. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.

E. Multipurpose Construction Adhesive: Formulation, complying with ASTM D 3498, that is recommended for indicated use by adhesive manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.2 INSTALLATION, GENERAL

A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.3 STANDING AND RUNNING TRIM INSTALLATION

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.

1. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
2. Stagger joints in adjacent and related standing and running trim.
3. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
4. Use scarf joints for end-to-end joints.
5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after gypsum-board joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

END OF SECTION 062023

SECTION 064113 – WOOD-VENEERED-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Architectural wood cabinets and benches.
   2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
   3. Shop finishing of architectural wood cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples for Initial Selection:
   1. Shop-applied transparent finishes.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 50 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.5 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOOD CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

2.2 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Type of Construction: Frameless.

C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.

D. Wood for Exposed Surfaces:
   1. Species: White maple.
   2. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
   3. Matching of Veneer Leaves: Book match.

E. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
      a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
   2. Drawer Subfronts, Backs, and Sides: Thermoset decorative panels with PVC or polyester edge banding.
   3. Drawer Bottoms: Thermoset decorative panels.

F. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
   2. Wood Moisture Content: 5 to 10 percent.
   3. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, [**100**] [**135**] [**170**] degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal.

F. Drawer Slides: BHMA A156.9.
1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated steel with polymer rollers, 60 lb capacity.

G. Door and Drawer Silencers: BHMA A156.16, L03011.

H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

B. Bench Cushion:
1. Foam: 3" thick, premium medium-high density open-cell/ urethane-ether foam meeting ASTM E84 requirements for flame spread and smoke developed.
2. Fabric and Colors: (FA-4) Stinson, Natural World NTL 23 Marigold.
3. Fasteners: Provide velcro to attach cushions to the wood bench.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of Cabinets: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for

shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

E. Bench and Cushions
1. Fasten wood trim to MDF panel. Provide soft wood trim as indicated on Drawings, for paint finish.
2. Construct cushions for benches in Children's Area as indicated on the Drawings.
3. Wrap foam with batting. Sew fabric covering with piping on edges.

2.7 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.

C. Transparent Finish:
1. Grade: Custom.
2. Finish: System - 5, conversion varnish.
3. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
   1. For shop finished items use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
   1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064113

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.

B. Architectural Woodwork Standards Grade: Premium.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Formica Corporation.
b. Lamin-Art, Inc.
c. Wilsonart LLC.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: Grade HGS.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

2. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
3. Particleboard: ANSI A208.1, Grade M-2.

4. Softwood Plywood: DOC PS 1.

5. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction as determined by testing performed on identical products by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.4 CABINET HARDWARE AND ACCESSORIES

A. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

B. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

C. Catches: Roller catches, BHMA A156.9, B03071.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.

a. Type: Full extension.
b. Material: Epoxy-coated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
4. For drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Grommets for Cable Passage: 2-inch (51-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Color: Black.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

END OF SECTION 064116

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

   1. BASF Corp. - Construction Chemicals.
   2. Euclid Chemical Company (The); an RPM company.
   3. Henry Company.
   4. Karnak Corporation.
   5. W.R. Meadows, Inc.

B. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668/D 1668M, Type I.

D. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch (13 mm) thick.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.

1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.

1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.

D. Where dampproofing interior face of above-grade, exterior [**concrete**] [**and**] [**masonry**] [**single-wythe masonry**] walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.

3.3 PROTECTION COURSE INSTALLATION

A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Polyisocyanurate foam-plastic board.
3. Mineral-wool blanket.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards."

B. Extruded Polystyrene Board, Type IV **INS-1**: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84. Used for below-grade perimeter insulation

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced **INS-2**: ASTM C 1289, foil faced, Type I, Class 1 or 2. Used for above-grade continuous wall insulation.
1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 MINERAL-WOOL BLANKETS

A. Mineral-Wool Blanket, Unfaced **INS-3**: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25

and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. For wall cavities where there is continuous rigid insulation on the outside face of the wall.

B. Mineral-Wool Blanket, Reinforced-Foil Faced **INS-4**: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene. For insulating wood roof truss cavities.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed truss construction, install blankets according to ASTM C 1320 and as follows:

a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

a. Exterior Walls: Set units with facing placed toward interior of construction and as indicated on Drawings. Vapor retarder plane in walls is at the sheathing, provided by the air barrier/rigid insulation plane.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
2. Install insulation to fit snugly without bowing.

END OF SECTION 072100

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Building wrap.
   2. Flexible flashing.
   3. Drainage material.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Water-Vapor Permeance: Not less than 75 perms (4300 ng/Pa x s x sq. m) per ASTM E 96/E 96M, Desiccant Method (Procedure A).
   2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
   1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.3 DRAINAGE MATERIAL

A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
   1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier as follows:

   1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
   2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.

B. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

   1. Seal seams, edges, fasteners, and penetrations with tape.
   2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

   1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
   2. Lap flashing over water-resistive barrier at bottom and sides of openings.
   3. Lap water-resistive barrier over flashing at heads of openings.

3.3 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION 072500

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For air-barrier assemblies.

1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.2 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

A. High-Build, Vapor-Retarding Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

1) Carlisle Coatings & Waterproofing Inc; Fire Resist Barritech NP.
2) Henry Company; Air-Bloc 32MR.
3) Hohmann & Barnard, Inc; Enviro-Barrier.
4) W.R. Meadows, Inc; Air-Shield LSR.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
b. Vapor Permeance: Maximum 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method.
c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.3 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.2 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

D. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

E. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.

F. Do not cover air barrier until it has been tested and inspected by testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: As determined by testing agency from among the following tests:

1. Air-barrier dry film thickness.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each [**600 sq. ft. (56 sq. m)**] <**Insert value**> of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

E. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Remove masking materials after installation.

END OF SECTION 072726

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Ridge vents.
4. Metal flashing and trim.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first 20 years nonprorated.
2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 80 mph (36 m/s) for 15 years from date of Substantial Completion.
3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 20 years from date of Substantial Completion.
4. Workmanship Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Butt Edge: Notched cut.
   2. Strip Size: Manufacturer's standard.
   3. Algae Resistance: Granules resist algae discoloration.
   4. Impact Resistance: UL 2218, Class 4.
   5. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, High Temperature: Minimum of 40-mil- (1.0-mm-) thick; with slip-resisting, polymer-film-reinforced or glass-reinforced top surface laminated to layer of butyl or SBS-modified asphalt adhesive; with release backing; cold applied; and evaluated and documented to be suitable for use for intended purpose under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Thermal Stability: Stable after testing at 240 deg F (116 deg C) according to ASTM D 1970/D 1970M.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C) according to ASTM D 1970/D 1970M.

2.4 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.
   1. Features:

      a. Nonwoven geotextile filter strips.

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.

1. Shank: Barbed.
2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.6 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Stainless steel.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

3.2 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

3.3 ASPHALT-SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip with tabs removed at least 7 inches (175 mm) wide with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch (13 mm) over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Fasten asphalt-shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.
1. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.

F. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.

1. Do not nail asphalt shingles within 6 inches (150 mm) of valley center.
2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.

G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes standing-seam metal roof panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.

B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.
2. Hail Resistance: MH.

I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.028 inch (0.71 mm).
b. Exterior Finish: Two-coat fluoropolymer.
c. Color: As selected by Architect from manufacturer's full range.

2. Clips: Two-piece floating to accommodate thermal movement.

a. Material: 0.028-inch- (0.71-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

3. Joint Type: Double folded.
4. Panel Coverage: 16 inches (406 mm).
5. Panel Height: 2.0 inches (51 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels and gutters at asphalt roofing.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fiber-cement siding and soffit.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For fiber-cement siding and soffit including related accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Research/evaluation reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CertainTeed Corporation.
    b. GAF.
    c. James Hardie Building Products, Inc.
    d. Nichiha Fiber Cement.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch (8 mm).

D. Horizontal Pattern: Boards 6-1/4 to 6-1/2 inches (159 to 165 mm) wide in plain style.

1. Texture: Smooth.

E. Vertical Pattern: 48-inch- (1200-mm-) wide sheets with smooth texture and fiber-cement battens at 12” on center.

F. Panel Texture: 48-inch- (1200-mm-) wide sheets with smooth texture.

G. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CertainTeed Corporation.
    b. James Hardie Building Products, Inc.
    c. Nichiha Fiber Cement.

B. Nominal Thickness: Not less than 5/16 inch (8 mm).

C. Pattern: 16-inch- (400-mm-) wide sheets with smooth texture.

D. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

B. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

C. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
3. For fastening fiber cement, use hot-dip galvanized fasteners.

D. Continuous Soffit Vents: Aluminum, hat-channel shape.

1. Net-Free Area: 6 sq. in./linear ft. (420 sq. cm/m).
2. Finish: White paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Install fasteners no more than 24 inches (600 mm) o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

B. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

C. Research reports.

D. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

E. Field quality-control reports.

F. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.

B. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: MH.

E. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced,TPO sheet.

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. Carlisle SynTec Incorporated
   b. Firestone Building Products;
   c. GAF;
   d. Johns Manville; a Berkshire Hathaway company; Versico Roofing Systems;

2. Thickness: 80 mils (2.0 mm), nominal.
3. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard.

E. Slip Sheet: ASTM D 2178/D 2178M, Type IV; glass fiber; asphalt-impregnated felt.

F. Slip Sheet: Manufacturer's standard, of thickness required for application.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
   1. Thickness: 1/2 inch (13 mm) thick.
   2. Surface Finish: Unprimed.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Thickness:
      a. Base Layer: 2-1/2 inches.
      b. Upper Layer: 2-1/2 inches.

B. Tapered Insulation: Provide factory-tapered insulation boards.
   1. Material: Match roof insulation.
   2. Minimum Thickness: 1/4 inch (6.35 mm).
   3. Slope:
      a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
      b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive, or
   2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

3.2 PREPARATION

A. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

   1. Submit test result within 24 hours after performing tests.

      a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072726 "Fluid-Applied Membrane Air Barriers."

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.

1. Tightly butt substrate boards together.
2. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
3. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.5 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for Installation Over Wood Decking:

1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.

    a. Fasten slip sheet according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
    b. Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install base layer of insulation with joints staggered not less than 24 inches (610 mm) in adjacent rows.

    a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

        1) Trim insulation so that water flow is unrestricted.

    e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

3. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.

    a. Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
    b. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

4. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.

    a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
    b. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
    c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    d. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

        1) Trim insulation so that water flow is unrestricted.

    f. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    g. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
    h. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
        1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place, or
        2) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 MECHANICALLY FASTENED ROOFING INSTALLATION

A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roof membrane with side laps shingled with slope of roof deck where possible.

G. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and flashing sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.6 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 2D (dull, cold rolled) finish.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m)minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal[**or manufactured item**] unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[**or manufactured item**].

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED REGLETS

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated and with interlocking counterflashing on exterior face, of same metal as reglet.
1. Material: Stainless steel, 0.019 inch (0.48 mm) thick.
2. Finish: Mill.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.[**Shop fabricate interior and exterior corners.**]

1. Accessories: Wire-ball downspout strainer ,valley baffles.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
1. Fabricate from the following materials:
   a. Galvanized Steel: 0.022 inch (0.56 mm) thick.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes. Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.

1. Fabricate from the Following Materials:
   a. Galvanized Steel: 0.028 inch (0.71 mm) thick.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.

1. Fabricate from the Following Materials:
   a. Galvanized Steel: 0.040 inch (1.02 mm) thick.

C. Base Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

2.9 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

B. Valley Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

C. Drip Edges: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of [**10 feet (3 m)**] <**Insert dimension**> with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering.

Comply with solder manufacturer's recommended methods for cleaning and neutralization.

5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.

D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below [**scupper**] [**or**] [**gutter**] discharge.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend

counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm).

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with [**elastomeric**] [**butyl**] sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."

C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

D. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

B. Shop Drawings: For roof accessories.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT SUPPORTS

A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm) thick.

1. Finish: Baked enamel or powder coat.
2. Color: As selected by Architect from manufacturer's full range.

D. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with [**1-1/2-inch- (38-mm-)**] <**Insert dimension**> thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide on top flange of equipment supports, continuous around support perimeter.
5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
9. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
10. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.2 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

1. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

C. Steel Tube: ASTM A 500/A 500M, round tube.

D. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

E. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

D. Security Grilles: [**3/4-inch (19-mm)**] <**Insert dimension**> diameter, ASTM A 1011/A 1011M steel bars spaced [**6 inches (150 mm)**] <**Insert dimension**> o.c. in one direction and [**12 inches (300 mm)**] <**Insert dimension**> o.c. in the other[**, shop-primed for field finish**]. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

I. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.

C. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pad-type, flat-mounted snow guards.
2. Rail-type, seam-mounted snow guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Delegated-Design Submittal: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculation of number and location of snow guards.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the jurisdiction in which the Project is located.

B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating point of failure of attachment to roof system identical as that used on this Project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attachment to building, based on the following:

1. Roof snow load.
2. Snow drifting
3. Roof slope.

4. Roof type.
5. Roof dimensions.
6. Roofing substrate type and thickness.
7. Snow guard type.
8. Snow guard fastening method and strength.
9. Snow guard spacing.
10. Coefficient of Friction Between Snow and Roof Surface: 0.
11. Factor of Safety: 2.

B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Snow Loads: As indicated on Drawings.

2.2 PAD-TYPE SNOW GUARDS

A. Flat-Mounted Metal Pad-Type Snow Guards:

1. Material: ASTM B 26/B 26M cast aluminum.

2. Attachment: Manufacturer's tested system, capable of resisting design loads.

2.3 RAIL-TYPE SNOW GUARDS

A. Seam-Mounted, Rail-Type Snow Guards:
1. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two rails.
2. Material and Finish: Aluminum; mill.
3. Seam clamps: ASTM B 221 (ASTM B 221M) aluminum extrusion or ASTM B 85/B 85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

1. Space rows as indicated on Shop Drawings.

2. Space rows as recommended by manufacturer.

B. Attachment for Asphalt Shingle Roofing:

1. Flat-Mounted, Pad-Type Snow Guards: Mechanically anchored through each factory-prepared hole with fasteners concealed by the shingles.

C. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.

2. Seam-Mounted, Rail-Type Snow Guards:

a. Install brackets to vertical ribs in straight rows.
b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
c. Torque set screw according to manufacturer's instructions.
d. Install cross members to brackets.

END OF SECTION 077253

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Urethane joint sealants.
   2. Mildew-resistant joint sealants.
   3. Latex joint sealants.
   4. Butyl joint sealants.
   5. Acoustical joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

A. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Pecora Corporation; Dymeric 240.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
   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. BASF Corporation; Construction Systems; MasterSeal SL 1 (Pre-2014: Sonolastic SL1).
      b. Pecora Corporation; NR-201.

2.3 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

a. Dow Corning Corporation.
b. GE Construction Sealants.
c. Pecora Corporation.
d. Sika.

C. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
c. Tremco Incorporated; Tremsil 200.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; AC-20.
b. Sherwin-Williams Company (The); 850A Siliconized Acrylic Latex Caulk.
c. Tremco Incorporated; Tremflex 834.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Bostik, Inc; Chem-Calk 300.
b. Pecora Corporation; BC-158.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; AC-20 FTR.
b. Tremco Incorporated; Tremco Acoustical Sealant.
c. United States Gypsum Company; SHEETROCK Acoustical Sealant.
2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Joints in stone paving units, including steps.
      c. Joints between different materials listed above.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, M, P, 50, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, S, P, 25, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in unit masonry.
      b. Joints in dimension stone cladding.
      c. Joints between metal panels.
      d. Joints between different materials listed above.

e. Perimeter joints between materials listed above and frames of doors windows and louvers.
f. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:
   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
   c. Other joints as indicated on Drawings.
2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:
   a. Aluminum thresholds.
   b. Sill plates.
   c. Other joints as indicated on Drawings.
2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Interior standard steel frames.
2. Exterior standard steel doors and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 INTERIOR STANDARD STEEL FRAMES

A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Frames: SDI A250.8, Level 2; SDI A250.4, Level B..

1. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Slip-on drywall.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A..

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches (44.5 mm).
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
d. Edge Construction: Model 1, Full Flush.
e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
f. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
g. Core: Polyisocyanurate.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
b. Construction: Face welded.

2.4 BORROWED LITES

A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).

B. Construction: Face welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.6 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

B. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

C. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

D. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

E. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with [**butted**] [**or**] [**mitered**] hairline joints.

1. Provide stops and moldings flush with face of door, and with [**beveled**] [**square**] stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Hollow-Metal Frames: Comply with SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.
2. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Solidly pack mineral-fiber insulation inside frames.
4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.

B. Related Requirements:
1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Algoma Hardwoods, Inc.
2. Graham Wood Doors; ASSA ABLOY Group company.
3. Mohawk Flush Doors, Inc.
4. VT Industries Inc.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Red oak.
3. Cut: Rotary cut.
4. Core: Particleboard.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish System 9, UV curable, acrylated epoxy, polyester, or urethane System 10, UV curable, water based or System 11, catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of access door and frame and for each finish specified.

C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:
1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
2. Locations: Wall and ceiling.
3. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage, factory primed.
4. Latch and Lock: Cam latch, hex-head wrench operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

2.4 FINISHES

A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing.
2. Manual-swing entrance doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

C. Samples: For each type of exposed finish required.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330/E 330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2. Entrance Doors:

a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than [**15**] [**25**] [**35**] [**45**] [**55**] [**65**] [**75**] <**Insert value**> as determined according to NFRC 500.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STOREFRONT SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer TriFab 451T or comparable product by one of the following:

1. EFCO Corporation.
2. Tubelite Inc.
3. YKK AP America Inc.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Tuffline 500 or comparable product by one of the following:

1. EFCO Corporation.
2. Tubelite Inc.
3. YKK AP America Inc.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 2- to 2-1/4-inch (50.8- to 57.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

    a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
    b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Cylinders: As specified in Section 087100 "Door Hardware."

E. Weather Stripping: Manufacturer's standard replaceable components.
1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

F. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

G. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

2.5 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.6 MATERIALS

A. Sheet and Plate: ASTM B 209 (ASTM B 209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.

D. Structural Profiles: ASTM B 308/B 308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from [**exterior**] [**interior**] [**interior for vision glass and exterior for spandrel glazing or metal panels**].
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Dual Finish (two tone): Allow for separate colors for interior and exterior.

2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum windows for exterior locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranties.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.
c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AAMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: 50.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K).

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.

E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.

F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.

2.2 ALUMINUM WINDOWS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer TriFab 451t or comparable product by one of the following:

1. EFCO Corporation.
2. TRACO.
3. YKK AP America Inc.

B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.

1. Kind: Fully tempered where indicated on Drawings.

D. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered where indicated on Drawings.

2. Lites: Two.

3. Filling: Fill space between glass lites with argon.
4. Low-E Coating: Sputtered on second or third surface.

E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

F. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Column Covers: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

D. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

E. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.4 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than [**50**] [**70**] percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

1. Dual Finish (two tone): Allow for separate colors for interior and exterior.

2. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

E. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085113

SECTION 085200 - WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum-clad wood windows.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranties.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.
c. Aluminum-Cladding Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: CW.
2. Minimum Performance Grade: 65.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K).

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.

2.2 WOOD WINDOWS

A. Aluminum-Clad Wood Windows:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Marvin Aluminum Clad Ultimate or comparable product by one of the following:

1. Hurd Windows and Doors.
2. Kolbe & Kolbe Millwork Co., Inc.
3. Pella Corporation.
4. Weather Shield Mfg., Inc.

C. Operating Types: Fixed.

D. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.

1. Exterior Finish: Aluminum-clad wood.

a. Aluminum Finish: Manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight and complying with AAMA 2605.

2. Interior Finish: Manufacturer's standard stain-and-varnish finish.

a. Exposed Unfinished Wood Surfaces: Manufacturer's standard species.
b. Color: As selected by Architect from manufacturer's full range.

E. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.

1. Kind: Fully tempered where indicated on Drawings.

F. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered where indicated on Drawings.

2. Lites: Two.
3. Filling: Fill space between glass lites with argon.
4. Low-E Coating: Sputtered on second or third surface.

G. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

H. Hardware, General: Provide manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.

I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

D. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085200

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:

a. Swinging doors.

2. Cylinders for door hardware specified in other Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product in each finish specified.

C. Door hardware schedule.

D. Keying schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Supplier Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
   a. Exit Devices: Two years from date of Substantial Completion.
   b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 SCHEDULED DOOR HARDWARE

A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

1. Door hardware is scheduled on Drawings.

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

2.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
2. Deadbolts: Minimum 1.25-inch (32-mm) bolt throw.

C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.

D. Lock Trim:

1. Description: Best 9K #15D.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

1. Best 9K series. No substitutions.

2.6 EXIT LOCKS AND EXIT ALARMS

A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

1. DETEX 017 Key. No substitutions.

2.7 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
b. Allegion plc.
c. Burns Manufacturing Incorporated.
d. Hiawatha, Inc; a division of the Activar Construction Products Group.
e. INOX by Unison Hardware, Inc.
f. Trimco.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Von Duprin 99 Series with 996 lever trim. No substitutions.

2.9 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Best Lock, Frederick County standard seven pin. No substitutions.

B. High-Security Lock Cylinders: BHMA A156.30; Grade 1 permanent cores that are removable; face finished to match lockset.

C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.10 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.

1. Existing System:

a. Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: Information to be furnished by Owner.

2.11 OPERATING TRIM

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Hager Companies.
d. Hiawatha, Inc; a division of the Activar Construction Products Group.
e. INOX by Unison Hardware, Inc.
f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
g. Trimco.

2.12 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. LCN 4040 XP series Closers. No substitutes.

2.13 AUTOMATIC DOOR OPERATORS

A. Surface-Mounted Door Operators: Provide electrically powered unit (top jamb / push side). Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide adjustable units to meet field conditions and requirements for opening force.

1. LCN 4640 with associated 8310 Series ADA-compliant, square, flush-mounted actuators and all required accessories for a fully functioning system.

2.14 REMOVABLE CENTER MULLION

A. Removable Center Mullion: Provide heavy-duty removable mullions for both aluminum and steel applications with all associated accessories, including keys.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Assa Abloy.
   b. Dorma.
   c. Von Duprin.

2.15 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Allegion plc.
   b. Baldwin Hardware Corporation.
   c. Burns Manufacturing Incorporated.
   d. Hager Companies.
   e. Hiawatha, Inc; a division of the Activar Construction Products Group.
   f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

g. Trimco.

2.16 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
2. Gasketing on Double Doors: 0.50 cfm per foot (0.000774 cu. m/s per m) of door opening.

2.17 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.18 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Hager Companies.
d. Hiawatha, Inc; a division of the Activar Construction Products Group.
e. INOX by Unison Hardware, Inc.
f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
g. Trimco.

2.19 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites and storefront framing.
2. Glazing sealants and accessories.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AGC Glass Company North America, Inc.
2. Guardian Glass; SunGuard.
3. JE Berkowitz, LP.
4. Oldcastle BuildingEnvelope™.
5. Pilkington North America.
6. Schott North America, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seals.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dow Corning Corporation.
    b. GE Construction Sealants; Momentive Performance Materials Inc.
    c. Pecora Corporation.
    d. Sika Corporation.
    e. Tremco Incorporated.

2. Applications: <**Describe types of glazing applications where this sealant is required**>.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.3 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.4 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-1: Clear fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.5 INSULATING GLASS SCHEDULE

A. Glass Type GL-2: Low-E-coated, clear insulating glass.

1. Basis-of-Design Product: Guardian SuperNeutral 54 Clear.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Visible Light Transmittance: 54 percent minimum.
11. Solar Heat Gain Coefficient: 0.28 maximum.
12. Safety glazing required where noted and as required by applicable codes.

END OF SECTION 088000

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fixed formed-metal louvers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural[**and seismic**] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.

B. Sample warranties.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M.
2. AWS D1.3/D1.3M.
3. AWS D1.6/D1.6M.

1.5 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.2 FIXED FORMED-METAL LOUVERS

A. Horizontal Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Airolite Company, LLC (The).
   b. Greenheck Fan Corporation.
   c. Ruskin Company.

2. Louver Depth: 6 inches (150 mm).
3. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, not less than 0.052 inch (1.32 mm) for frames and 0.040 inch (1.02 mm) for blades.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:

   a. Free Area: Not less than 7.5 sq. ft. (0.70 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
   b. Point of Beginning Water Penetration: Not less than 900 fpm (4.6 m/s).
   c. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s) free-area intake velocity.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.3 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.

C. Louver Screening for Galvanized-Steel Louvers:

1. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire.

2.4 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, [**G60 (Z180)**] [**G90 (Z275)**] zinc coating, mill phosphatized.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E 488/E 488M conducted by a qualified testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.5 FABRICATION

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 GALVANIZED-STEEL SHEET FINISHES

A. Finish louvers after assembly.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent, so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating compatible with the organic

coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780/A 780M.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

3.2 ADJUSTING

A. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions.
   2. Suspension systems for interior ceilings and soffits.
   3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:
   1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 7.5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. ClarkDietrich Building Systems.
   2. Marino\WARE.
   3. MBA Building Supplies.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
   1. Steel Studs and Runners:
      a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
      b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
   2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
   3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
         1) Blazeframe Industries.
         2) ClarkDietrich Building Systems.
         3) MBA Building Supplies.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. ClarkDietrich Building Systems.
   2. Minimum Base-Metal Thickness: 0.0269 inch.

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.0179 inch.
   2. Depth: As indicated on Drawings.

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.

3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Hanger Attachments to Concrete:
1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
1. Depth: 2-1/2 inches.

E. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.0269 inch.
   b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
   a. Minimum Base-Metal Thickness: 0.0296 inch.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Armstrong World Industries, Inc; Drywall Grid Systems.
   b. Chicago Metallic Corporation; 650/670 Fire Rated Drywall Ceiling Suspension.
   c. United State Gypsum Company; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:
   1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches o.c.
   2. Carrying Channels (Main Runners): 48 inches o.c.
   3. Furring Channels (Furring Members): 16 inches o.c. unless noted otherwise.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

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. Interior gypsum board.

B. Related Requirements:
   1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
   2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Gypsum.
2. CertainTeed Corporation.
3. Continental Building Products, LLC.
4. Georgia-Pacific Building Products.
5. National Gypsum Company.
6. PABCO Gypsum.
7. Temple-Inland Building Products by Georgia-Pacific.
8. USG Corporation

2.3 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

2.5 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Continental Building Products, LLC.
   d. Georgia-Pacific Building Products.
   e. PABCO Gypsum.
   f. Temple-Inland Building Products by Georgia-Pacific.
   g. USG Corporation.
2. Core: 5/8 inch, regular type.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Expansion (control) joint.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Laminating adhesive shall have a VOC content of 50 g/L or less).

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool. Provide 3” thick blankets unless noted otherwise.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through

perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Accumetric LLC.
   b. Grabber Construction Products.
   c. Pecora Corporation.
   d. Specified Technologies, Inc.
   e. USG Corporation.
2. Acoustical joint sealant shall have a VOC content of 250 g/L or less.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: As indicated on Drawings.
2. Ceiling Type: Ceiling surfaces.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

A. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.
6. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.

3. Level 4: Surfaces scheduled to receive wall covering and paint.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

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.

1.3 SUMMARY

A. Section Includes:
   1. Ceramic tile.
   2. Waterproof membrane.
   3. Marble thresholds.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:
   1. Each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide samples of each color blend.
   2. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile and Trim: Refer to product selections on Finish Key on Drawing I000.

2.3 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bonsal American, an Oldcastle company.
      b. Bostik, Inc.
      c. LATICRETE SUPERCAP, LLC.
      d. MAPEI Corporation.

2.4 SETTING MATERIALS

A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bonsal American, an Oldcastle company.
      b. Bostik, Inc.
      c. Custom Building Products.
      d. LATICRETE SUPERCAP, LLC.
      e. MAPEI Corporation.
   2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
   3. For wall applications, provide nonsagging mortar.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. LATICRETE SUPERCAP, LLC.
   e. MAPEI Corporation.

2.6 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 10 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
   1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Grout Sealer: Grout sealer approved by manufacturer for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.
      b. Tile floors consisting of tiles 8 by 8 inches or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Refer to the Finish Key on Drawing I1000 for joint widths.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

J. Install grout sealer in accordance with manufacturer’s written instructions.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
   1. Ceramic Tile Installation: TCNA F113; thinset mortar.
      a. Thinset Mortar: Modified dry-set mortar.
      b. Grout: Standard sanded cement grout.

B. Interior Wall Installations, Wood or Metal Studs or Furring:
   1. Ceramic Tile Installation: TCNA W243; thinset mortar on gypsum board.
      a. Thinset Mortar: Modified dry-set mortar.
      b. Grout: Standard sanded cement grout.

END OF SECTION 093013

SECTION 095100 - ACOUSTICAL CEILINGS

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 acoustical ceilings and exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Ceiling suspension-system members.
   2. Structural members to which suspension systems will be attached.
   3. Method of attaching hangers to building structure.
   4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
   5. Size and location of initial access modules for acoustical panels.
   6. Items penetrating finished ceiling and ceiling-mounted items including the following:
      a. Lighting fixtures.
      b. Diffusers.
      c. Grilles.
      d. Speakers.
      e. Sprinklers.
      f. Access panels.
      g. Perimeter moldings.

B. Product test reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL CEILINGS

A. Manufacturers:
   1. Armstrong World Industries.
   2. CertainTeed Corporation.
   3. USG Company.

B. Acoustic Panels Type ACT - 1: ASTM E1264, conforming to the following:
   1. Size: 24 x 24 inches.
   2. Thickness: 3/4 inch.
   3. Composition: Mineral Fiber.
   4. Light Reflectance: .90.
   5. Fire Hazard Classification: Class A.
   6. Edge: Beveled tegular.
   7. Surface Color: White.
   8. Surface Finish: Factory-Applied Latex Paint.
   9. Grid Size: 15/16”.
   10. Source: Ultima High NRC No. 1951 by Armstrong World Industries.

C. Acoustic Panels Type ACT-2: ASTM E1264, conforming to the following:
   1. Size: 24 x 24 inches.
   2. Thickness: 5/8 inch.
   3. Composition: Wet formed ceramic and mineral fiber.
   4. Light Reflectance: .82.
   5. Fire Hazard Classification: Class A.
   6. Edge: Square.
   7. Surface Color: White.
   8. Surface Finish: Factory-Applied Latex Paint.
   9. Grid Size: 15/16”.

10. Source: Ceramaguard Fine Fissured – Non-Perforated No. 605 by Armstrong World Industries.

D. Wood Ceiling Panels Type C - 1: ASTM E1264, conforming to the following:
1. Size: 96 x 5-1/4 inches with 3/4" reveal.
2. Thickness: 3/4 inch.
3. Composition: Wood veneer on particleboard substrate.
4. NRC: .50.
5. Fire Hazard Classification: Class A.
6. Veneer: Cherry.
7. Grid Size: 12' HD linear carriers concealed with integral clips; Armstrong model 5371 for 6" module.
8. Accessories: Fiberglass infill, panel splice, clips and fasteners recommended by manufacturer.
9. Source: Woodworks Linear No. 6460W1 by Armstrong World Industries.

E. Wood Ceiling Panels Type C - 2: ASTM E1264, conforming to the following:
1. Size: 24 x 48 inches.
2. Thickness: 3/4 inch.
3. Composition: Wood veneer on particleboard substrate.
4. Perforation Pattern: Armstrong W2 pattern.
5. Fire Hazard Classification: Class A.
6. Veneer: Cherry.
7. Grid Size: 15/16 inch (1/4" reveal).
8. Source: Woodworks Concealed No. 5983 by Armstrong World Industries.

2.3 METAL SUSPENSION SYSTEM

A. Manufacturers:
1. Armstrong World Industries.
2. CertainTeed Corporation.
3. Chicago Metallic Corporation.
4. Fry Reglet Corporation.
5. Gordon, Inc.
6. United States Gypsum, Company.

B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.

2.4 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Hold-Down Clips: Manufacturer's standard hold-down.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify structure and MEP components that will remain exposed after ceiling installation is complete, have been painted. Do not proceed until painting is complete.

B. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

C. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing required to support standard

suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently. Do not eccentrically load system or induce rotation of runners.

E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

F. Install acoustical and wood panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

6. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096500 - RESILIENT FLOORING

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. Resilient floor tile.
   2. Resilient base.
   3. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Tile: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than 6-by-9-inch sections.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 2,000 square feet or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for flooring installation and seaming method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 THERMOSET-RUBBER BASE (RB-1)

A. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

B. Thickness: Minimum 1/8” thick.

C. Lengths: Full rolls to minimize joints.

D. Outside Corners: Pre-formed.

E. Inside Corners: Job formed.

F. Product: Refer to Finish Key on Drawing I1000 for product selection, color, height and thickness.

2.3 LUXURY VINYL TILE (LVT-1 and LVT-2)

A. Product Standard: ASTM 1859.
   1. Type: Class III printed film, vinyl plank Type B Embossed.
   2. Thickness: 5 mm.

B. Installation Method: Full glue down.

C. Accessories: Refer to Finish Key on Drawing I1.00.

D. Warranty: 10 manufacturer’s warranty.

E. Colors, Patterns and Installation Pattern: Refer to Finish Key on Drawing I1000 for product selection, sizes and additional requirements.

2.4 RUBBER MOLDING ACCESSORIES

A. Description: Rubber carpet edge for glue-down applications, reducer strip for resilient flooring, joiner for tile and carpet transition strips.

B. Profile and Dimensions: As required for conditions encountered.

C. Colors: Match adjacent flooring color.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to flooring manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as the space where it is to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient flooring material.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles in pattern selected by Architect.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Miter or cope corners to minimize open joints.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish. Apply one coat.

C. Cover flooring until Substantial Completion.

END OF SECTION 096500

SECTION 096700 - EPOXY FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Fluid applied, aggregate reinforced, epoxy flooring.

1.2 RELATED SECTIONS
A. Section 033000 - Cast In Place Concrete.

1.3 REFERENCES
A. ASTM C307 - Tensile Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
B. ASTM C579 - Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings.
C. ASTM C580 - Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings.
D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
E. ASTM D-635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in Horizontal Position.
F. ASTM D-2240 - Rubber Properties - Durometer Hardness.

1.4 QUALIFICATIONS
A. Applicator: Company specializing in resinous matrix flooring applications with 10 years documented experience, and approved by manufacturer.

1.5 SUBMITTALS
A. Submit shop drawings, product data, samples, and installation instructions under provisions of Division 1 Section.
B. Submit shop drawings indicating divider strip layout, and details of adjacent components.

1.6 OPERATION AND MAINTENANCE DATA
A. Submit cleaning and maintenance data.
B. Include procedures for stain removal, repairing surface, and cleaning.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Deliver products and store at to site under provisions of Section 016000.
B. Maintain minimum temperature of 55 degrees F. Keep products away from open flame.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Do not install flooring when temperature is below 60.
B. Maintain this temperature range, 24 hours before, during and 72 hours after installation of flooring.
C. Ventilate area where flooring is being installed. Post and enforce NO SMOKING or OPEN FLAME signs until flooring has cured.
D. Provide uniform lighting of 25 fc measured at area of installation.
E. Restrict traffic from area where flooring is being installed or is curing.

1.9 WARRANTY

A. Provide 5 year warranty under provisions of Section 017700.

B. Warranty: Include coverage against flooring delamination from substrate, degradation of surface finish and watertightness.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sherwin Williams, General Polymers Flooring.

B. Substitutions: Under provisions of Section 012500.

2.2 PERFORMANCE PROPERTIES

A. Compressive Strength: 12,000 psi per ASTM C 579.

B. Tensile Strength: 2500 psi per ASTM C-307.

C. Hardness: 70/65 per ASTM D-2240 Shore D Durometer.

D. Flexural Strength: 4,500 per ASTM C 580.

2.3 MATERIALS

A. Primer/ Binder: Two part epoxy no. 3579.

B. Binder Resin: Epoxy resin glaze no. 3561.

C. Aggregate: No. 5900F ESTES colored quartz aggregate.

D. Self-Leveling Epoxy: No. 3745.

E. Seal Coat: 4409 WB Polyurethane Satin

F. Color: Refer to Finish Key on Drawing I000.

G. Basis of Design: Sherwin Williams, General Polymers Ceramic Carpet #400 Decorative Broadcast Flooring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting Work.

B. Verify that substrate is ready to receive work, that subfloor surface is clean, dry, and free of substances which could affect bond.

C. Subfloor Moisture Conditions: Perform calcium chloride moisture test in accordance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg. F. Moisture emission shall not exceed 3lb/1000 sq. ft. for 24 hr. period.

D. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfigurement.

3.3 PREPARATION

A. Shot blast existing surface to remove sub-floor ridges and bumps, oil, grease and other contaminats. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is cured.

C. Clean substrate.

3.4 INSTALLATION

A. Install epoxy flooring following manufacturers instructions.
B. Apply primer at rate and in accordance with manufacturer's instructions.
C. Apply elastomeric membrane to required thickness.
D. Apply all materials in accordance with manufacturer's instructions. Continuously verify proper thickness of flooring.
E. Apply each coat of flooring within thickness range required by manufacturer. Apply flooring to a minimum thickness of 3/16 inch.
F. Finish to a level surface with proper slope to drains. Provide cove base at vertical surfaces and carry membrane/surfacing up walls a minimum of 6", except in janitors closets where it shall be 48" AFF.

3.5 PROTECTION

A. Do not permit traffic over finished floor surfaces.
B. Barricade area to protect flooring until cured.

END OF SECTION

SECTION 096813 - CARPET TILE

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 modular carpet tile.

B. Related Requirements:
   1. Section 096500 "Resilient Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Pattern type, location, and direction.
   4. Pile direction.
   5. Type, color, and location of insets and borders.
   6. Type, color, and location of edge, transition, and other accessory strips.
   7. Transition details to other flooring materials.

C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: 4 Full-size units for each type indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, the following:
      a. More than 10 percent edge raveling, snags, and runs.
      b. Dimensional instability.
      c. Excess static discharge.
      d. Loss of tuft-bind strength.
      e. Loss of face fiber.
      f. Delamination.
   3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Carpet Tile: Refer to The Finish Key on Drawing I1000 for carpet tile Basis of Design selections.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, releasable, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Resilient Edge/Transition Strips: Refer to Section 096500.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
   1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
      c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using

solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 098433 - ACOUSTICAL WALL TREATMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes site-installed, prefabricated acoustical panels for walls.

B. Related Sections:

1. Section 09250 - Gypsum Drywall Systems: Substrate.

1.2 REFERENCES

A. UL (Underwriters Laboratories, Inc.) - Fire Resistance Directory.

1.3 PERFORMANCE REQUIREMENTS

A. Fire Performance Characteristics: Fabric panel assembly tested in accordance with ASTM E 84 with gypsum wall board substrate, UL rated Class A, with the following results.

1. Smoke Developed: 25 or less.
2. Flame Spread: 25 or less.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data, details, performance data, physical properties, and installation instructions.

B. Samples:

1. Submit 3 bx 5-inch-size fabric-samples indicating manufacturer's full range of colors and patterns available for initial selection. Include sample seam.
2. Submit two full size panels of “Small” panels to illustrate edging profile, facing fabric, fill components, and mounting system.

C. Manufacturer's Installation Instructions: Submit fabric maintenance data, recommended cleaning material, and cleaning and stain removal methods.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit fabric maintenance data, recommended cleaning material, and cleaning and stain removal methods.

1.6 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 5 years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver fabric panel materials to the project until all concrete, masonry, plaster, and other wet work has been completed and is dry.

B. Accept prefabricated panels on site in manufacturer’s original packaging. Inspect for damage.

C. Store materials inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion, and damage.

1.8 ENVIRONMENTAL REQUIREMENTS
- A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.
- B. Install acoustic units after interior wet work is dry.

1.9 FIELD MEASUREMENTS
- A. Verify field measurements prior to fabrication.

1.10 WARRANTY
- A. Furnish five (5) year manufacturer's warranty for defective workmanship or materials by manufacturer.

1.11 EXTRA MATERIALS
- A. Section 01700 - Execution Requirements: Requirements for extra materials.
- B. Furnish extra fabric in quantity to recover two panels completely for each color provided.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Carnegie.
- B. Substitutions: Section 012500 - Substitution Procedures.

2.2 SOUND PANELS
- A. Acoustical Wall Panels:
  1. Thickness: 1" thick acoustic wall panels.
  2. Sizes:
     a. Standard Panels: Diamond shape, Small 9-1/4" x 16" and Large 18-1/2" x 32".
     b. 3D Panels: Diamond shape, Small 9-1/4" x 16" and Large 18-1/2" x 32".
  3. Edge Profile: 3/16" beveled edge.
  4. Panel core materials: 1inch thick Quiet-Core.
  5. Surface Burning Characteristics: ASTM E84 Flame Class A, spread less than 25.
  6. Mount: Mechanical "Z" clip.
  7. Layout: Refer to Drawings.
  8. Source: Xorel Artform Panels by Carnegie.
- B. Fabric:
  1. Flame Spread: 10.
  2. Smoke Developed: 0.
  3. Backing: Unbacked.
  4. Source: Meteor and Deco Embroidered by Xorel Fabrics by Carnegie as follows:
     a. F1 - Deco Embroidered #6265, color #815.
     b. F2 - Meteor #6427, color #721.
     b. F3 - Meteor #6427, color #730.

2.3 ACCESSORIES
- A. Adhesive as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify gypsum board surface is within specified tolerances and has been taped and sanded smooth and primed.

B. Verify electrical receptacles, switch-boxes and other similar wall penetrations have been sealed to prevent air leakage.

3.2 INSTALLATION

A. Installation in accordance with manufacturers written instructions.

B. Fabricate system so that frames or mounting members of the system shall not telescope through the face of the fabric. Provide lining to hide frame and substrate materials from view when transparent fabric is specified.

C. Install fabric with warp (vertical) and weft (horizontal) threads made plumb, level and true.

D. Align pattern, texture, and grain of fabric at seams and throughout the entire panel wall without distortion to the geometry of the fabric or its pattern.

3.3 ERECTION TOLERANCES

A. Maximum Variation of Panels from True Location: Plus or minus 1/8 inch.

B. Maximum Variation of Surfaces Intended to be Flush: Plus or minus 1/32 inch.

C. Maximum Variation of Reveal Width: Plus or minus 1/16 inch.

3.4 FIELD QUALITY CONTROL

A. Remove and replace panels which are damaged, soiled, or otherwise found unacceptable to Architect.

B. Adjust panels dislodged from indicated position, plumb, and level.

3.5 CLEANING

A. Clean surfaces of upholstered panels free from dirt and handling marks using methods and materials recommended by panel system manufacturer.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished installation from damage.

END OF SECTION

SECTION 099100 - PAINTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes surface preparation and field application of paints, stains, and other coatings to all interior and exterior exposed surfaces of the building.

B. Related Sections:

1. Section 051200 - Structural Steel: Shop primed items.
2. Section 053100 - Steel Deck: Shop primed items.
3. Section 055000 - Metal Fabrications: Shop primed items.
4. Section 064113 - Architectural Cabinets: Shop finished cabinet work.
5. Section 092900 - Gypsum Board Assemblies: Taping and bedding of gypsum board.

1.2 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

B. Measurement of specular gloss; ASTM D523.

1.3 SUBMITTALS

A. Product Data: Submit data on finishing products. Include VOC data.

1. Submit product data, including label analysis for each product proposed for use.
2. Specifically include percent solids-by-volume, volatile organic compound (VOC) content (lb/gal), and lead content (percent of weight of dried film).
3. Schedule:
   a. List each material proposed for use, and cross-reference to specific coating system and substrate application.
   b. Identify each material by manufacturer's catalog number, product name, and generic classification.
   c. Include typewritten list identifying coating systems and colors applied to each room, space, or item.

B. Samples:

1. Prepare one sample of each transparent coating system scheduled on actual wood substrate proposed for use. Apply in each top coat color scheduled.
2. Prepare one sample of each opaque coating system scheduled on actual substrate materials proposed for use. Apply in each top coat color scheduled.
3. Step back each coat and process at least one inch to show bare substrate and each coat and process in system build-up.
4. Minimum sample size of 4 by 8 inches.
5. Label each sample to indicate materials, color, sheen, DFT of each coat applied, and total system DFT.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide products of single manufacturer.

B. Applicator Qualifications: Company specializing in commercial painting and finishing with 5 years documented experience.

C. Regulatory Requirements:

1. Comply with CPSC 16 CFR 1303 and other applicable federal, state, and local regulations limiting lead content of coatings to be applied.

2. Comply with applicable regulations limiting volatile organic compound (VOC) content of coatings to be applied. Conduct and report measurement of volatile organic compounds in coatings in accordance with Ozone Transport Commission restrictions for Ohio.

D. Certifications: Submit certification from manufacturer that materials furnished meet or exceed specified requirements and comply with applicable lead and VOC content.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

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 five years documented experience.

1.7 PRE-INSTALLATION MEETING

A. Convene minimum one week prior to commencing Work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Do not apply exterior coatings during rain or snow when relative humidity is < 20% or >85%, when temperature is <5 degrees above dew point, or moisture content of surfaces exceed those required by paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and solvent reducable Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

F. Refer to EPA for special procedures for removing existing lead based paint.

1.10 WARRANTY

A. Furnish five year manufacturer warranty for paints and coatings.

B. Warrant installation to be free from defects in material and workmanship for 5 years.

C. Repair or replace defects occurring during warranty period.

D. Defects include but are not limited to pinholes, crazing or cracking, loss of adhesion to substrate, deficient thickness, improper materials and workmanship.

1.11 EXTRA MATERIALS

A. Supply 1 unopened gallon of each color; store where directed.

B. Label each container with color, type, texture, and room locations, in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers:

1. Sherwin-Williams Inc. products are listed as a minimal standard of quality, unless noted otherwise. Products that are of equal or better quality of the following manufacturer’s are acceptable pending Architects approval.
2. PPG Architectural Finishes.
3. Pratt and Lambert, Inc.
4. McCormick Paints.
5. Benjamin Moore.
6. Duron Paints.
7. Behr Paints.

2.2 COMPONENTS

A. Coatings: Ready mixed, except field catalyzed coatings. Prepare coatings:

1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.
4. Ensure VOC contents of field applied coatings do no exceed limits, after thinning, per requirements of local authorities having jurisdiction.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.

C. Patching Materials: Latex filler.

D. Fastener Head Cover Materials: Latex filler.

2.3 MIXING

A. Use factory prepared colors matching approved samples. Site tinting will not be permitted.

B. Apply coatings of consistency recommended by manufacturer. Thin only within recommended limits using thinners approved by coating manufacturer.

2.4 MATERIALS

A. Paint: Refer to Schedule at end of section for specific product selections. Select primary products of a single manufacturer for each coating or paint system, unless otherwise specified.

B. Secondary products such as linseed oil, turpentine and shellacs shall be first line quality products of a reputable manufacturer.

2.5 COLORS

A. Interior Colors: Refer to Finish Key on Drawing I000 for paint colors.

B. Exterior colors: To be selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions are ready to receive Work as instructed by product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

C. Do not proceed with surface preparation or coating applications until conditions are suitable.

D. Application of paint or finish to surfaces shall constitute acceptance of that surface.

E. Test shop applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard and glass fiber reinforced gypsum: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and walls: 8 percent.

G. Surfaces Not To Be Painted:

1. Architectural concrete.
2. Clay and glass unit masonry, decorative concrete unit masonry, and stone.
3. Aluminum and aluminum based alloys, copper and copper based alloys, lead and lead based alloys, nickel and nickel based alloys, stainless steel, plated architectural metals, and "weathering" metals.
4. Decorative plastic and metal laminates, and synthetic countertops.
5. Elastomeric membranes and flashings, roofing materials, and exterior sealants and calking.
6. Acoustic materials.
7. Rubber, vinyl, or plastic seals and bumpers.
8. Surfaces concealed or inaccessible in finished construction unless specifically required.
9. Other surfaces specifically scheduled or indicated to remain unfinished or unpainted.

H. Materials and Products Not To Be Painted:

1. Items with integral or factory-applied final finish unless indicated otherwise.
2. Moving parts of operating equipment such as valve and damper operators, linkages, sensing devices, motor and fan shafts.
3. UL, FM or other code-required labels, name plates, identification or performance rating labels.
4. Sprinkler heads.
5. Mechanical and electrical items within unfinished spaces unless noted otherwise.

3.2 PREPARATION

A. General:

1. Paint all surfaces unless noted in paragraphs 3.1H and I above.
2. Correct minor defects.
3. Remove temporary labels, wrappings, and protective coverings from surfaces to be coated.
4. Seal stains, marks, and other imperfections which may bleed through surface finishes.

B. Gypsum Board:
1. Refer to Sections 092900 for general surface preparation.
2. Fill remaining cracks, depressions, holes and other irregularities with spackling compound.
3. Sand rough or high spots left by joint cement or spackling compound without damaging paper face.
4. Remove dust by wiping with damp cloths or vacuuming.

C. Steel - Uncoated:
1. Remove weld spatter by chipping or grinding.
2. Clean interior and weather protected steel in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning". Clean areas of excessive corrosion or scale in accordance with SSPC SP7 "Brush-Off Blast Cleaning".
3. Clean exterior steel permanently exposed to elements in accordance with SSPC SP6 "Commercial Blast Cleaning".
4. Apply metal conditioner to bare surfaces in accordance with manufacturer's recommendations, paying particular attention to abrasions, welds, bolts, and nuts. Allow to set as recommended by solution manufacturer. Rinse with clean water with rust inhibitor mixed with water or applied immediately following rinse. Allow to dry.
5. Prime coat immediately.

D. Steel - Prime Coated:
1. Remove loose primer and rust to feather-edge at adjacent sound primer by cleaning in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning".
2. Apply metal conditioner to abrasions, welds, bolts, and nuts in accordance with manufacturer's recommendations. Allow to set as recommended by manufacturer. Rinse with clean water with rust inhibitor mixed with water or applied immediately following rinse. Allow to dry.
3. Prime coat bare areas immediately.

E. Steel - Galvanized:
1. Remove white rust by cleaning in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning". Exercise care not to remove galvanizing.
2. Pretreat surfaces to receive solvent reducible coatings immediately.

F. Wood - Transparent Finish:
1. Remove excess residue from knots, pitch streaks, cracks, open joints, and sappy spots. Ensure exposed fasteners are countersunk.
2. Sand wood surfaces and edges smooth. Remove dust after each sanding.
3. After stain is dry and before sanding sealers are applied, fill nail holes, cracks, open joints and other defects with putty or plastic wood filler.
4. Tint fillers to match stain and finish coatings. Work fillers well into and perpendicular to grain before set. Wipe excess from surface.

G. Concrete - Painted Finish:
1. Concrete to cure minimum 60 days.
2. Fill voids and cracks.
3. Remove any residue, dirt of foreign material prior to priming.

3.3 APPLICATION

A. General Requirements:
1. Apply coatings of type, color, and sheen as scheduled.

2. Coat all surfaces specified, scheduled, illustrated, and otherwise exposed unless specifically noted otherwise.
3. Apply products in accordance with manufacturers printed instructions. Use application materials, equipment, and techniques as recommended by coating manufacturer and best suited for substrate and type of material being applied.
4. Do not apply finishes to surfaces that are improperly prepared.
5. Number of coats specified are minimum number acceptable.
6. Apply coating systems to total dry film thickness scheduled. Apply material at not less than manufacturer's recommended spreading rate. Do not exceed maximum single coat thickness recommended by coating manufacturer. Do not double-back with spray equipment building up film thickness of two coats in one pass.
7. Ensure that edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent of flat surfaces.
8. Finish edges of coatings adjoining other materials or colors sharp and clean, without overlapping.

B. Prime Coats:
1. Apply initial coat to surfaces as soon as practical after preparation and before subsequent surface deterioration.
2. Backprime exterior woodwork with specified primer.
3. Backprime interior woodwork scheduled to receive transparent finish with gloss varnish reduced 25 percent with mineral spirits.
4. Apply primer to wood and metal sash before field glazing.

C. Intermediate and Top Coats:
1. Allow previously applied coat to dry before next coat is applied.
2. Sand and dust lightly between coats as recommended by coating manufacturer.
3. Apply each coat to achieve uniform finish, color, appearance, and coverage free of brush and roller marks, runs, misses, visible laps or shadows, hazing, bubbles, pin holes, or other defects.
4. If stains, undercoats, or other conditions show through final topcoat, correct defects and apply additional topcoats until coating film is of uniform finish, color, and appearance.

D. Finish Matching:
1. Finish closets same as adjoining rooms, unless otherwise specified.
2. Finish tops, bottoms, and edges of doors same as door faces. Apply sanding sealer to cut-outs. When faces are different colors, finish edges of doors to match space from which they are visible when door is in partly open position.
3. Finish other surfaces not specifically mentioned to match adjoining surfaces.

E. Finishing Mechanical And Electrical Equipment:
1. Paint metal surfaces, including pipes, sprinkler pipes, conduit, machinery, equipment, panels and boxes where exposed in finished spaces, mechanical rooms or on exterior. Paint equipment machinery gray, paint pipes and conduits to match adjacent surfaces.
2. Paint sight-exposed galvanized ducts on interior of building.
3. Paint all roof protrusions including but not limited to roof ventilators, goosenecks, PVC plumbing stacks, exhaust fans and vents on roof, including aluminum items.
4. Paint exposed PVC condensate drain pipe on exterior of building.
5. Remove prefinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately, color to match adjacent surface.

6. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, to match face panels.
7. Paint exposed conduit and electrical equipment occurring in finished areas.
8. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
9. Refer to Divisions 15 and 16 for schedule of color coding and identification banding of equipment, duct work, piping, and conduit, not in public spaces.
10. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
11. Apply each coat of paint uniformly to minimum dry film (MDF) thickness specified in schedule below, or as recommended by manufacturer.

3.4 CLEANING

A. Promptly remove spilled, splashed, or spattered coatings. Clean spots, oil, and other soiling from finished surfaces using cleaning agents and methods which will not damage material.
B. If completed construction is damaged beyond normal cleaning or repair by painting operations, replace damaged items at no additional cost to Owner.
C. Maintain premises and storage areas free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
D. Collect waste, cloths, and material which may constitute fire hazards and place in closed metal containers; remove from site daily along with empty containers.Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.
E. Upon completion of work, remove paint and varnish spots from floor, glass, and other finished surfaces. Remove from premises rubbish and accumulated materials. Leave work in clean, orderly, and acceptable condition.
F. Spot painting will be allowed to correct soiled or damaged paint surfaces only when touch-up spot will blend into surrounding finish and is invisible to normal viewing. Otherwise, re-coat entire section to corners or visible stopping point.

3.5 PROTECTION

A. Protect completed finish and painting work, and protect adjacent finish surfaces from paint splatter, spills and stains.
B. Use adequate drop cloths and masking procedures during progress of work.

3.6 SCHEDULE

A. Concrete and Masonry Surfaces:
   1. Coating System CM-1: Latex Finish w/ Acrylic Block Filler
      Surface: Exterior concrete or concrete masonry units.
      Sheen: Eggshell.
      Prime Coat: Exterior Block Filler at 10.0 mils.
      Under Coat: Exterior Latex House Paint at 1.5 mils.
      Top Coat: Exterior Latex House Paint at 1.5 mils.
   2. Coating System CM-2: Latex Finish
      Surface: Interior concrete masonry units.
      Sheen: Eggshell
      1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
      2nd Coat: S-W ProMar® 200 Zero VOC Latex Eg-Shel, B20W2200 Series

3rd Coat: S-W ProMar® 200 Zero VOC Latex Eg-Shel, B20W2200 Series (4 mils wet, 1.6 mils dry per coat)

B. Metal Surfaces:
1. Interior non-ferrous metals and zinc-coated (galvanized) steel.
1st Coat: S-W ProCryl Universal Water Based Primer, B66-310 Series (5 mils wet, 2 mils dry)
2nd Coat: S-W Pro Industrial Zero VOC Acrylic, Eg-Shel, B66-600 Series
3rd Coat: S-W Pro Industrial Zero VOC Acrylic, Eg-Shel, B66-600 Series
2. Exterior non-ferrous metals and zinc-coated (galvanized) steel.
1st Coat: S-W A-100 Exterior Latex Satin, A82 Series
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.3 mils dry per coat)
3. Interior ferrous metals.
1st Coat: S-W All Surface Enamel Latex Primer, A41W210 (4 mils wet, 1.6 mils dry)
2nd Coat: S-W Pro Industrial Zero VOC Acrylic, Eg-Shel, B66-600 Series
3rd Coat: S-W Pro Industrial Zero VOC Acrylic, Eg-Shel, B66-600 Series
4. Exterior ferrous metals.
1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
1st Coat: S-W Pro Industrial Acrylic, Semi-gloss, B66-650 Series
2nd Coat: S-W Pro Industrial Acrylic, Semi-gloss, B66-650 Series

C. Gypsum Surfaces:
1. Interior gypsum board walls (typical).
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.6 mils dry per coat)
2. Interior gypsum board walls (restrooms and bathrooms).
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-gloss, B31-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-gloss, B31-2600 Series (4 mils wet, 1.5 mils dry per coat)
3. Interior gypsum board ceilings.
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.3 mils dry per coat)

D. Wood Surfaces:
1. Painted Interior wood.
1st Coat: S-W ProClassic Waterborne Acrylic Satin, B20W51 (4 mils wet, 1.4 mils dry)
2nd Coat: S-W ProClassic Alkyd Satin, B33-220 Series
3rd Coat: S-W ProClassic Alkyd Satin, B33-220 Series (4 mils wet, 1.8 mils dry per coat)
2. Stained Interior wood.
1st Coat: S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, Gloss A68 Series
3rd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, Gloss or Satin (4 mils wet, 1.0 mil dry per coat)

E. Miscellaneous Surfaces: Paint all incidental items not mentioned above, and including but not limited to:
   1. Bollards.
   2. Lintels.

END OF SECTION

SECTION 099600 - HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance and regular coating systems on the following substrates:
   1. Exterior and interior architecturally exposed structural steel.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Label each coat of each Sample.
   3. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. VOC content.

1.4 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Coatings: Not less than one ½ gallon of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture’s label with the following information:
   1. Product name and type (description).

2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Products scheduled at the end of this section are by Tnemec Inc. and The Sherwin-Williams Company and establish a standard of quality. Subject to compliance with requirements, provide products by one or more of the following:
1. The Carboline Co.
2. The Sherwin Williams Co. (S-W).
3. Tnemec, Inc.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:
1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC content limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Service's "Standard Practice for the Testing of Volatile Organic Chemical Emissions from Various Sources Using Small Scale Environmental Chambers."

D. Colors: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
   1. Report in writing conditions that may affect application, appearance, or performance of paint.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions.

B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

C. Steel Substrates: Refer to Section 051213 – Architecturally Exposed Structural Steel for steel prep and priming.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment with prime coat only.
   3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:
   1. Polyurethane System:
      a. Full Prime Coat: Polyurethane, one-component, pigmented, prime coat, as recommended by manufacturer.
      b. Topcoat: Polyurethane, two-component, pigmented, semi-gloss:
         1) Tnemec Series 73 Endura-Shield Aliphatic Acrylic Polyurethane at 2.0 to 3.0 mils dry, per coat.

END OF SECTION 099600

SECTION 101400 - SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes
   1. Interior signs.
   2. Exterior building letters and numbers.

1.2 SUBMITTALS

A. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.
B. Signage Schedule: Complete with location of each sign and the required copy/text.
C. Manufacturer's Installation Instructions: Submit installation template and attachment devices.
D. Samples: Provide one full size sample of a restroom sign for approval.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.
B. Installer Qualifications: Trained and authorized by manufacturer for installations of required scope and product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Package signs, labeled in name groups.
B. Store adhesive attachment tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.
B. Do not install signs when ambient temperature is lower than recommended by manufacturer.
C. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 ROOM SIGNAGE

A. Engraved Signs:
   1. Type: Engraved modular sign panel consisting of two components bonded together:
      a. Top Layer: Engraveable photopolymer with woodgrain face and engraved text of contrasting color.
      b. Backer Plate: 3Form custom acrylic panel as selected by Architect.
   2. Colors: Cocoa Bala woodgrain with light beige text.
   3. Basis of Design: Rio Collection by InPro SignScape.
B. Qualities:
   1. Tactile and braille graphics raised 1/32 in. minimum. Braille to be Grade II .

2. No letters to be less than 5/8 in. in height. Dimensions and stroke ratios to comply with ADA.

C. Quantity: Provide one next to each door in project.
D. Installation: Adhesive strips.
E. General signage requirements:
1. All signage to comply with the requirements of the 2015 IBC.
2. Fire Department Connection (FDC): Provide red embossed metal sign with “This FDC serves the automatic sprinkler system at “bldg. address”, in 1" high letters.
3. All rooms housing sprinkler control valves shall be identifies with signs reading “Sprinkler Control Valves” in 2" high letters.
4. Provide other code required signs not listed above but are specified in other sections or required by Authority Having Jurisdiction (AHJ).

2.2 BUILDING LETTERS AND NUMBERS
A. Type: Cast aluminum letters.
B. Size:
1. Building Name: 14 inches tall.
2. Building Address: 8 inches tall.
C. Finish: Satin finish.
D. Font: Arial regular.
E. Name: Refer to Drawings.
F. Mount: Projected mount with brackets; PM-2.
G. Basis of Design: Cast letters by A.R.K. Ramos.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 013000 - Administrative Requirements - Verification of conditions before starting Work.
B. Install signs after wet and dust producing operations are complete and before substantial completion.

3.2 INSTALLATION
A. Room Identification Signage:
1. Install plumb level and secure using vinyl foam tape.
2. Install signage at locations and heights required to meet ADAAG requirements.
B. Install signs after surfaces are finished, in locations indicated by Architect.
C. Position sign 4 inches from strike side of door; on wall surface, 60 in. above finished floor to center of sign, level.
D. Exterior Building Letters: Install in accordance with the manufacturers instructions. Confirm location of address with Fire Marshal.

3.3 SCHEDULE - INTERIOR SIGNS
A. Follow the schedule below for code required signage.
B. Provide one sign adjacent to each door.

C. Schedule: In addition to the requirements above, include the following signage.

ID	Size	Type/Location	Description
1.	10 x 8 in.	Rest Room	Men or Women
2.	8 x 6 in.	Exit	Exit
3.	8 x 6 in.	Exit Only	Exit only/ Alarm will sound
4.	10 x 10 in.	Support Room (single line of copy)	Electrical or Mechanical
5.	10 x 10 in.	Assembly Spaces	Community room, children's area, stacks, office, receiving/ work
6.	10 x 10 in.	Room Signs	All other room/ space designations

END OF SECTION

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for each exposed product and for each color and texture specified.

D. Product certificates.

E. Maintenance data.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

PART 2 - PRODUCTS

2.1 SOLID-POLYMER UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products (Santana-Comtec Products) or comparable product by one of the following:
   1. General Partitions Mfg. Corp.
   2. Hadrian Manufacturing Inc.
   3. Knickerbocker Partition Corporation.
   4. Metpar Corp.
   5. Rockville Partitions Incorporated.

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
   1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
   2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
   3. Polymer Panel Finish: One color and pattern in each room.
      a. Color and Pattern: Match Scranton Products Nickle.

E. Pilaster Shoes: Manufacturer's standard design; polymer.
   1. Polymer Color and Pattern: Matching pilaster.

F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.

G. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   1. Material: Stainless steel.
   2. Hinges: Manufacturer's standard integral hinge for solid-polymer doors.
   3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
   4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
   5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
   6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at bottoms of posts. Provide shoes at posts to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Clearances: Maximum 1/2 inch between pilasters and panels; 1 inch between panels and walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

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. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Custodial accessories.

B. Related Requirements:
1. Section 088300 "Mirrors" for frameless mirrors.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

B. Dryers: Manufacturer agrees to repair or replace dryers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials:
   1. Soap dispensers.
   2. Toilet paper dispensers.
   3. Waste recepticles.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AJW Architectural Products.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.
   5. GAMCO Specialty Accessories; a division of Bobrick

C. TA-1 Grab Bar:
   1. Basis of Design: Bobrick Model B-6806 x length indicated.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length:
      a. TA - 1A: 18 inches long.
      b. TA – 1B: 36 inches long.
      c. TA – 1C: 42 inches long.

D. TA-2 Toilet Tissue (Roll) Dispenser:
   1. Owner furnished, contractor installed.

E. TA-3 Mirror Unit:
   1. Basis of Design: Bobrick model B-165.
   2. Frame: Stainless-steel channel.
      a. Corners: Mitered and mechanically interlocked.
   3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
      a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
   4. Sizes:
      a. TA-3A: 24 x 36 inches
      b. TA-3B: 60 x 36 inches.

F. TA-4 Soap Dispenser:
   1. Owner furnished, contractor installed.

G. TA-5 Paper Towel (Folded) Dispenser:
   1. Owner furnished, contractor installed.

H. TA-6 Sanitary-Napkin Disposal Unit, Partition Mounted:
   1. Basis of Design: Bobrick model B-354.
   2. Type; Leakproof, with disposal liners.
   3. Mounting: Recessed Partition mounted, dual access.
   4. Capacity; 1.2 gal.
   5. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
   6. Receptacle: Removable.
   7. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Dryer, Inc.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
      d. Excel Dryer Inc.

B. TA-7 High Speed Warm-Air Dryer:
   1. Basis of Design: Xlerator model XL-SB by Excel Dryer, Inc.
   2. Description: High-speed, warm-air hand dryer.
   3. Mounting: Recess mounted, with optional ADA Compliant Recess kit.
   4. Operation: Infrared optical sensor activated.
   5. Options: Noise reduction nozzle, and HEPA filter.
   6. Cover Material and Finish: Brushed stainless steel.
   7. Electrical Requirements: 120 V, 15 A, 1450 W.

2.5 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Specialties, Inc.
      b. Diaper Deck & Company, Inc.
      c. GAMCO Specialty Accessories; a division of Bobrick.
      d. Koala Kare Products.

B. TA-8 Diaper-Changing Station:
   1. Basis of Design: Gamco model BCS-1.
   2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap, and smooth concave changing area.
      a. Engineered to support minimum of 250-lb static load when opened.
   3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
   4. Operation: By pneumatic shock-absorbing mechanism.
   5. Material and Finish: HDPE in manufacturer's standard color.
   6. Accessories: Nylon safety strap and two hooks for bags or purses.

2.6 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. TA-9 Mop and Broom (and Rag) Holders:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Specialties, Inc.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
      d. GAMCO Specialty Accessories; a division of Bobrick.
   2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
      a. TA-9A: Basis of Design: Bobrick model B-223 x 24.
      b. TA-9B: Basis of Design: Bobrick model B-239 x 34.
   3. Mop/Broom Holders: Four spring-loaded, rubber hat, cam type.
   4. Material and Finish: Stainless steel, No. 4 finish (satin).
      a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
      b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.7 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire protection cabinets and fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
   1. Sheet: ASTM B 209.
   2. Extruded Shapes: ASTM B 221.

C. Acrylic Bubble: One piece.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   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. J. L. Industries, Inc., a division of Activar Construction Products Group.
      b. Larsen's Manufacturing Company.

B. Cabinet Construction:
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes. Coordinate rating with wall in which the cabinet is mounted.

C. Cabinet Material: Steel sheet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
   1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Aluminum sheet.

F. Door Material: Aluminum sheet.

G. Door Style: Full bubble with frame.

H. Door Glazing: Molded acrylic bubble.
   1. Acrylic Bubble Color: Clear, transparent.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
   3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
      a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet glazing.
         2) Application Process: Pressure-sensitive vinyl letters.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

K. Finishes:
   1. Manufacturer's standard baked-enamel paint for the following:
      a. Interior of cabinet.
   2. Aluminum: Clear anodic.
   3. Steel: Baked enamel or powder coat.
      a. Color and Gloss: White.
      b. Source: Formed sheet steel, 20 gage, primed, semi-recessed type, Cameo Series Model FS C2409-5R for fire rated walls and C2409-R for non-rated walls.; size 24" x 9" x 3 -½ inches.

L. FIRE EXTINGUISHERS
   1. Type 1: Multi-purpose dry chemical type U.L. 299, (amonium phosphate), with pressure gauge:
   2. Capacity: 10.0 lbs.
   3. U.L. Rating: 4A:60B:C.

4. Acceptable product: Larsen's MP10.
5. Finish: Steel, enamel, red color.

M. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 109900 - MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes miscellaneous specialties as scheduled.

B. Related Sections:

1. Section 055000 - Metal Fabrications: Metal supports.
2. Section 061000 - Rough Carpentry: In-wall framing and plates for support of items scheduled.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on miscellaneous specialties describing size, finish, details, and attachment methods.

C. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of walls to receive anchor attachments.

PART 2 PRODUCTS

2.1 LOCK BOX

A. Qualities: 1/4" thick steel lock bock for securing building key for fire department access to building.

B. Size: 5"H x 4"W x 3-1/4"D.

C. Mounting: Surface mounted with through wall mounting kit.

D. Location: As directed by local AHJ.

E. Source: Model SupraSafe 2HS/TS by GE.

2.2 TACK BOARD

A. General: Colored cork surface fused to 28 gage steel substrate.

B. Size: 36" h x 48" w x 7/8" thick.

C. Wood Trim Profile: Half-Round No. 7; stain color as selected by Architect.

D. Tackable Surface: Forbo Linoleum, color as selected by Architect.

E. Mounting Hardware: Cleat bracket by manufacturer.

F. Source: Model No. FB-4836-7-MA Fabric Tackable Panel by Peter Pepper Products.

2.3 BOOK RETURNS

A. Exterior Book Drop:

1. General: Exterior faceplate with weather shroud. KwikDrop Depository and Entry chute. Interior 14-inch long non-obstructing chute and enclosure, KwikLock System and Airbloc System.
2. Construction: Stainless steel exterior faceplate, weather shroud, depository door and entry chute. Stainless steel finish.

3. Airbloc: Decco Neoprene (40 Duro) Rubber panels.
4. Lock: KwikLock System allows locking the depository from inside.
5. Self-adhesive Decal in Black that reads: BOOK RETURN.
6. Overall Dimensions: 20”L x 17-3/16”W x 18-3/16”H.
7. Depository opening: 15-1/8”W x 3-7/8”H.
8. Accessories: 99-8100 Braille label reads “ Book Dro p ”.
9. Basis of Design: Kwik Drop Ensemble model #15-8951 by Kingsley Metal Works, Inc.

B. Interior Book Drop:
1. General: One piece interior thru wall depository.
2. Construction: Stainless steel faceplate and aluminum entry chute and slide.
3. Lock: Locks from inside with spring loaded thumbscrews.
4. Self-adhesive Decal in Black that reads: BOOK RETURN.
5. Overall Dimensions: 22-7/8” w x 11” h x 8-13/16” d.
6. Depository opening: 19-5/8” w x 3-1/2” h.
7. Accessories: 99-8100 Braille label reads “ Book Dro p ”.
8. Basis of Design: Ease SlimLine thruWall model # 10-8105 by Kingsley Metal Works, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.
B. Verify exact location of accessories for installation.
C. Verify field measurements are as indicated on product data.
D. See Section 061000 - Rough Carpentry for installation of blocking in wall.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.
B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install items in accordance with manufacturer's instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights and Locations: As required by accessibility regulations or as indicated on Drawings.

END OF SECTION

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Residential appliances.

1.2 RELATED SECTIONS
A. Division 26: Electrical connections.

1.3 SUBMITTALS
A. Product Data: Submit in accordance with Section 013300.
B. Submit manufacturer's literature for each specified product, including installation instructions and rough-in data.

1.4 COORDINATION
A. Coordinate with related work for proper installation of equipment in cabinets and proper connection of plumbing and electrical supply.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Products listed are to establish a standard of quality.
B. Substitutions: In accordance with the requirements of Section 013000.

2.2 REFRIGERATOR
A. Bottom-Freezer Refrigerator:
1. Capacity: 21.0 c.f.
2. Size: 29-3/4" x 36-5/8" d x 69-7/8" h.
3. Finish: White.
4. Freezer Capacity: 6 cu. ft.
5. Factory-installed ice maker.
6. Basis of Design: GE model GBE21DGKWW.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install equipment plumb, level, and secure in prepared rough openings in accordance with manufacturer's installation instructions.
B. Connect to permanent utilities in accordance with manufacturers printed instructions.
C. After connections are complete, test and adjust operation and leave in complete working order.

End of Section

SECTION 122413 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Roller Shades: Two full-size units of color, and shadeband material used.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Draper Inc.
2. Hunter Douglas Contract.
3. Lutron Electronics Co., Inc.
4. Silent Gliss.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Stainless steel.
   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Chain tensioner, jamb mounted.
2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
   a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands

indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Reverse, from front (interior face) of roller.
3. Shadeband-to-Roller Attachment: Removable spline fitting into integral channel in tube.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:
1. Shadeband Material: Light-filtering fabric.
   a. Type 1: Hunter Douglas Hospitality Wisteria Wanderlust collection; 3% openness.
   b. Type 2: Hunter Douglas Hospitality Standard collection; 3% openness.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect.

G. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.
2. Endcap Covers: To cover exposed endcaps.

H. Basis of Design: RB 500 Roller Shades by Hunter Douglas Contract.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Refer to Finish Key.
2. Type: PVC-coated fiberglass.
3. Thickness: 0.020 inches.
4. Weight: 11.3 oz./sq. yd..
5. Roll Width: 98 inches
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: 1 and 5 percent.
8. Color: As indicated on Drawings.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
   1. Opaque Shadebands: Located so shadeband is not closer than 1-1/2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Roller Shade Locations: Provide shades in all exterior windows as follows:
   1. Type 1: Room 109 Children’s Area.
   2. Type 2: All other windows excluding exterior entrance doors and adjacent sidelights.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:
1. Plastic laminates, for each color, pattern, and surface finish.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS, minimum 1.2 mm thick.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Formica Corporation.
   b. Nevamar; a Panolam Industries International, Inc. brand.
   c. Pionite; a Panolam Industries International, Inc. brand.
   d. Wilsonart

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As indicated in Finish Key on Drawing I100.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material at Sinks: Medium-density fiberboard made with exterior glue or exterior-grade plywood.

G. Core Thickness: 3/4 inch.
   1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
   1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Medium-Density Fiberboard: ANSI A208.2, Grade 130 .
   2. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 1-1/4-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.4 MISCELLANEOUS MATERIALS

A. Installation Adhesive: Water proof type meeting VOC requirements for NE Region.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
   2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.
   1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Secure backsplashes to walls with adhesive.
   3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

END OF SECTION 123623.13

SECTION 123661.16 - SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops and vanity. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS (SS-1 and SS-2)

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
1. Products: Subject to compliance with requirements, provide products by one of the following:
a. Avonite Surfaces.
b. E. I. du Pont de Nemours and Company.
c. Formica Corporation.
d. Meganite Inc.
e. Samsung Chemical USA, Inc.
2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124 at vanities.
4. Stainless Steel Sinks: Refer to Division 22 Plumbing for under-mount sinks.
5. Colors, Patterns, and Edge Profile: Refer to Finish Key on Drawing I000 for selection.
6. Basis of Design: DuPont Corian.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom.

B. Configuration:
1. Front: Full bull nose.
2. Backsplash: Straight, slightly eased at corner.

3. End Splash: Matching backsplash.

C. Countertops: 1/2-inch- thick, solid surface material.

D. Backsplashes: 1/2-inch- thick, solid surface material.

E. Joints: Fabricate countertops without joints.

F. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 VANITY FABRICATION

A. Fabricate vanity according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom.

B. Configuration: Wall mounted vanity with arched side panels, front panel enclosure, and splashes.

C. Countertops: 1/2-inch- thick, solid surface material.

D. Backsplashes: 1/2-inch- thick, solid surface material.

E. Sink: Corian model no. 810 integral bowl.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.4 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

C. Countertop Supports:
1. Type 1: Work station brackets by A & M Hardware, Inc. Manheim, Pa. (www.aandmhardware.com), 1/8 in. thick steel, 18 x 24 inches; field paint to match wall.
2. Type 2: Counter brackets model EC-0808 (8 x 8 inch) and EC-0812 (8 x 12 inch) extruded aluminum brackets by the Rangine Corp. (www.rakks.com), finish as selected by Architect.
3. Type 3: Hidden Support Brackets: Model “Forward L” Bracket by Centerline Brackets; 2-1/2" w x 20" l x ½" thick steel bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install support brackets in accordance with manufacturer’s instructions.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.

C. Fasten subtops to supports by screwing through subtops into supports. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.

E. Install sinks in accordance with manufacturer’s instructions and seal to countertops.

F. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

G. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

H. Install aprons to backing and countertops with adhesive.

I. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

J. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 123661.19 - QUARTZ AGGLOMERATE FABRICATIONS

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. Quartz agglomerate countertops.
   2. Quartz agglomerate backsplashes.
   3. Quartz agglomerate end splashes.
   4. Quartz agglomerate apron fronts.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
   1. Show locations and details of joints.
   2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:
   1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cambria.
      b. E. I. du Pont de Nemours and Company.
      c. Meganite Inc.
      d. Samsung Chemical USA, Inc.
   2. Colors and Patterns: Refer to Finish Key on Drawing I000 for requirements.
   3. Basis of Design for QZ-1: Cambria Quartz Surfaces.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Custom.

B. Configuration:
   1. Front: Bullnose edge with apron, 1-1/2 inches high.
   2. Backsplash: Straight, slightly eased at corner.
   3. End Splash: Matching backsplash.

C. Countertops: 2 cm thick, quartz agglomerate with front edge built up with same material.

D. Backsplashes: 2 cm thick, quartz agglomerate.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Joints: Fabricate countertops in sections for joining in field.
   1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
   2. Joint Type: Bonded, 1/32 inch or less in width.
   3. Joint Type: Grouted, 1/16 inch in width.
   4. Joint Type: Sealant filled, 1/16 inch in width.

5. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

H. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

C. Countertop Supports:
1. Type 1: Work station brackets by A & M Hardware, Inc. Manheim, Pa. (www.aandmhardware.com), 1/8 in. thick steel, 18 x 24 inches; field paint to match wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Install support brackets in accordance with manufacturer’s instructions.

C. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

E. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
   2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

G. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

H. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

I. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
   1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

J. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.19

SECTION 220499 – PLUMBING SCOPE

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 DESCRIPTION OF WORK

A. The work to be performed under these Specifications shall include providing all labor, materials, and equipment necessary to furnish and install, complete, properly, and fully all plumbing work as shown on the Drawings or herein specified. It is the intent of these Specifications that a complete operating system be installed; this Contractor shall carefully examine the site, drawings, and Specifications, and shall include all items necessary to accomplish this purpose. The work, in general, shall include, but shall not be limited to the following:

1. Provide sanitary drainage systems as indicated. Extend sanitary sewers 5'-0" outside of exterior walls, for extension under the Site Contract. Final connections by the Plumbing Contractor

2. Provide fire service and water service as indicated. Extend **fire service and** water service 5'-0" outside of exterior wall, **each**, for extension under the Site Contract. Final connections by the Plumbing Contractor.

3. Provide interior sanitary and vent drainage system as indicated, including floor drains, cleanouts, traps, and vents.

4. Provide interior domestic hot and cold water distribution systems as indicated. Provide valves and backflow preventers.

5. Provide domestic hot water heating equipment.

6. Provide plumbing fixtures and equipment shown.

7. Provide wet fire protection system.

8. Provide plumbing services and final connections for equipment furnished under various Contracts or by the Owner as indicated.

9. Provide insulation for piping and equipment as specified.

10. Testing, adjusting and balancing all plumbing piping and equipment.

11. Furnish combination starter/disconnects, magnetic starters, manual starters, and fused disconnect switches, to the Electrical Contractor for installation on all plumbing equipment. Coordinate all electrical requirements with the Electrical Contractor before ordering such equipment.

12. Type "RK" fuses for the starter/disconnect switches shall be furnished and installed under the Plumbing Contract as specified. The Plumbing Contractor shall properly size and select overloads and disconnect switch fuses in accordance with the National Electrical Code requirements. The Plumbing Contractor shall furnish to the Electrical Contractor the equipment manufacturer's circuit protection data.

13. All control and interlock wiring shall be by the Plumbing Contractor.

1.3 WORK BY OTHER TRADES

A. Cutting, patching, painting, electrical, plumbing, **fire protection,** etc., shall be done by the affected trade at this Contractor's expense for changes required in work already installed or work required by other trades for changes made by this Contractor in type or size of equipment purchased.

1.4 WORK NOT INCLUDED

A. The following construction and equipment related to the work under this Contract will be provided by others:

1. Openings in new roofs. (General Contractor)

2. Openings in new exterior walls. (General Contractor)

3. Furring around piping. (General Contractor)

4. Final painting of interior surfaces. (General Contractor)

5. Recesses and openings in construction for plumbing piping and equipment. (General Contractor) Chases for piping where specifically shown on the Drawings. (General Contractor)

6. All electric power wiring to all electrically-operated plumbing equipment. (Electrical Contractor) The Electrical Contractor will be responsible for all power wiring and associated terminations to line and load side of equipment as well as mounting of all combination starter/disconnects, magnetic starters, manual starters, fused disconnect switches, etc. furnished by the Plumbing Contractor and external to equipment they are designated to serve, except where such items are factory installed as an integral part of the equipment. The Electrical Contractor will make final connections to all equipment as directed by the Plumbing Contractor.

7. Water meter will be furnished by the Water Authority for installation by the Plumbing Contractor, with all necessary costs included in the Plumbing Contract.

8. HVAC condensate drainage, except for condensate drain piping installed under the Plumbing Contract, as indicated. (HVAC Contractor)

9. Extension of site utility services from Plumbing Contractor's terminal pipe locations as indicated. (General Contractor) Final connections by the Plumbing Contractor.

10. Foundation drains will be constructed under the General Contract. Final connections and extension of storm piping by Plumbing Contractor.

11. Tapping to existing water main with main valve and valve box as indicated. (Water Authority)

12. Tapping to existing gas main with main valve and valve box as indicated. (Gas Company)

13. Building fire protection system. (Separate Fire Protection Contract) Plumbing Contractor to provide flange connection for fire protection system. Coordinate with Fire Protection Contractor as to type and location of flange.

PART 2 – PRODUCTS

2.1 NOT APPLICABLE TO THIS SECTION

PART 3 – EXECUTION

3.1 NOT APPLICABLE TO THIS SECTION

END OF SECTION 220499

SECTION 220500 – BASIC PLUMBING MATERIALS AND METHODS

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 PLUMBING WORK

A. These Specifications are issued to cover all work in connection with the complete installation of the plumbing work. Plumbing work is hereby defined to include work as herein specified and as shown on the Drawings issued in connection with this project. Any reference in these Specifications to the Contractor shall hereby be considered a reference to the Plumbing Contractor. Any reference or letting of work to subcontractors or manufacturers in these Specifications does not relieve the Contractor of his responsibility for the work, materials, and equipment under this Contract. The Plumbing Contractor is responsible for the work and performance of his subcontractors.

B. **Fire protection work shall also be included as part of the Plumbing Contract. All fire protection work shall be completed by a licensed, certified Fire Protection Contractor responsible to the Plumbing Contractor.**

C. The word “building” used throughout these Specifications shall be interpreted to mean the entire Building Complex.

D. The actual runs and locations of all piping, equipment, and materials shall be determined at the site and shall be installed to meet the various conditions at the building. It is, however, the Contractor's responsibility to predetermine the exact locations of piping and equipment, and to notify the other contractors accordingly and prior to any installation to avoid confliction with other piping and equipment. Any changes necessary to conceal pipes or clear pipes and equipment of other trades shall be made without additional expense to the Owner.

E. All work shall be executed and all equipment constructed and installed in accordance with the requirements of the Pennsylvania Department of Labor and Industry, applicable IBC Codes, the Maryland Department of Environmental Protection, ASME, the Department of Labor, Safety and Health Regulations for Construction, OSHA, the National Fire Protection Association, the National Electrical Code as amended to date of bidding, and all applicable federal, state, county and local ordinances and regulations. Nothing contained in these Specifications or shown on the Drawings shall be construed to conflict with the aforesaid codes, ordinances, or regulations. Certificates of approval shall be obtained from any department issuing same, and shall be turned over to the Owner at the completion of the work. All fees and permits required shall be satisfied and obtained by the Contractor and the cost shall be included in the Contract price.

F. The Contractor shall carefully examine the general building drawings, all mechanical and electrical drawings, and carry on his work so as not to delay or interfere with the work of other trades. The Contractor shall obtain in writing from the other contractors such data as is necessary to coordinate his work with other branches. This coordination must take place prior to any piping or equipment installation. As the work in the building nears completion, all threading, cutting, and similar work shall be done where directed by the Architect. Upon completion of the work, all remaining waste materials and rubbish resulting from the Contract work shall be removed from the building and premises.

G. Where the phrase "or approved equivalent," "or equivalent," or "approved" appears in these Specifications, it shall refer to the prior to bidding approval of the Architect/Engineer on the

material or equipment involved. Substitutions of non-named suppliers after bidding shall be summarily rejected.

H. The term "Provide" means to furnish and install. The term "Furnish", used separately, means to obtain and deliver on the job for installation by other trades.

I. The General Contractor will provide chases and openings in walls, floors, ceilings, and partitions of new construction to receive pipe piping, risers, and other equipment insofar as it is possible to predetermine the exact location, but the Contractor shall install his work sufficiently in advance of the building construction to permit his work to be built into place. The Contractor shall advise the General Contractor of the exact size and location of all chases and openings required for the installation of his work, and shall check size and location of all such chases and openings provided by the General Contractor.

J. The Contractor shall furnish and place all sleeves required for pipes passing through new floors, walls and ceilings before such general construction work is built into place. The Contractor shall place all inserts required for hangers and supports, as the construction work progresses, so that unnecessary cutting of construction work will be eliminated.

K. Equipment and materials of similar types shall be of the same manufacturer unless specifically indicated otherwise on the Drawings or herein specified. The Contractor shall make final connections between all equipment furnished under this Contract and equipment furnished under other contracts, except as otherwise specified herein.

L. The materials used throughout shall be those of reputable manufacturers and shall be the best of their respective kinds. All equipment, components and materials shall be installed in a neat and workmanlike manner in accordance with best trade practices, manufacturer's recommendations, and applicable codes and standards and by persons skilled in each particular branch of the work assigned to them. All work shall be installed subject to the approval of the Architect.

M. All piping work shall be installed plumb, level, and square per code requirements. All piping shall be run in straight horizontal or vertical sections, outside of sloped drainage piping, and shall be under inspection during installation. Any piping, fittings, hangers, and/or systems deemed unacceptable per inspection during installation shall be repaired, replaced, and corrected with no additional cost to the project.

N. A complete list of materials proposed for each installation shall be submitted to the Architect for approval before delivery to the site. The Contractor shall submit samples of materials for approval at the site as requested by the Architect. Such materials may be incorporated into the structures after serving their purpose as samples.

O. Where the Contractor elects to substitute approved materials or equipment for materials or equipment specified, the Contractor will be held responsible for all architectural, structural, mechanical, and electrical changes required for their installation at no additional cost to the Owner. If additional engineering design is required, the Contractor shall reimburse the design engineer all costs.

P. The Contractor shall be entirely responsible for all apparatus, equipment and appurtenances furnished by him or his Subcontractors in connection with the work, and special care shall be taken to protect all parts thereof in such manner as may be necessary or as may be directed. Protection shall include covers, crating, sheds, or other means to prevent dirt, grit, plaster, or other foreign substances from entering the working parts of machinery or equipment. Special care shall be taken to keep all open ends of pipes, etc., closed while in storage and during installation. Where equipment must be stored outside the building, it shall be totally covered and secured with heavy waterproof tarps and kept dry at all times. Where equipment has been subject to moisture, it shall be suitably dried out before placed in service. Rusted piping,

interior or exterior of piping, will not be permitted for installation. Equipment with rusted finishes will not be permitted before or after installation. Materials and equipment shall be stored in areas designated by the Architect.

Q. The Contractor or his subcontractors will not be permitted to use corridors as storage areas for their piping, materials, or equipment. Piping, materials, and equipment shall be stored in areas as coordinated with the Architect.

R. Grades, elevations and locations shown on the Drawings are approximately correct; however, the Contractor shall field check and otherwise verify all such data at the site before proceeding with the work. The Contractor shall make necessary survey equipment available at all times and shall make use of such equipment wherever necessary to properly install his piping or equipment.

S. The Contractor shall visit the site and thoroughly acquaint himself with conditions existing at the site before submitting his proposal as will be held responsible for the installation of the work complete in every detail. The Contractor shall especially review the Architect's phasing schedule and ensure compliance with this schedule.

T. All work shown on the Drawings and not specifically included in the Specifications shall be considered a part of the Contract work. All work included in the Specifications and not specifically included on the Drawings shall also be considered a part of the Contract work.

U. Carefully examine all Drawings and Specifications included under this Contract and Drawings and Specifications included under other contracts and report any discrepancies noticed to the Architect.

V. Due to the small scale of the Drawings, it is not possible to indicate all offsets, fittings, valves, access panels, adapters, and similar parts which may be required. The Drawings are diagrammatic generally indicative of the work to be installed. The Contractor shall carefully investigate the structural and finish conditions affecting the work and arrange all work accordingly, furnishing necessary parts and equipment as may be required to meet the various conditions.

W. The Contractor shall layout his work from dimensions of Architectural and Structural Drawings and actual dimensions of equipment being installed. Layouts in congested areas should not be scaled from Plumbing, **Fire Protection**, HVAC and Electrical Drawings. Clearances shall be provided on all sides of equipment as required for proper maintenance purposes and as required by the Pennsylvania Department of Labor and Industry.

X. The Contractor shall furnish the services of manufacturers' representatives for all equipment furnished under these Contract Documents. The amount of factory service provided by the Contractor shall be as normally recommended and furnished by the various equipment manufacturers unless specified otherwise. Testing of such systems and equipment shall be made under the direct supervision of competent authorized service representatives. Any and all expenses incurred by the equipment manufacturers' representatives shall be borne by the Contractor.

Y. All equipment and materials shall be manufactured in accordance with national standards established by manufacturer's associations, engineering and testing societies, such as NBMA, NEMA, ASTM, AMCA, ASME, ANSI, ACI, FM, U.L., where such standards have been established. The standards shall be construed to mean their correct specifications and designations as amended, as of the date of bid opening.

Z. When the installation is reported in writing by the Contractor to be complete and ready for acceptance, tests and inspection shall be made by the Contractor in the presence of the Architect to ascertain whether it complies with the Specifications and Contract, and upon its

failure to do so, the Contractor shall at once remedy all defects and shortcomings and any additional tests that may be required shall be entirely at the Contractor's expense. All of the testing work shall be done when and as directed by the Architect before the system is accepted.

AA. Include any excavation and backfill as required for work included under this Contract, as herein specified. Work shall conform to all applicable federal, state, county, and local regulations governing safety provisions at excavation sites.

BB. The General Contractor will install insulation with vapor barrier in certain areas of the building. Where the building insulation or vapor barrier is broken due to the installation of piping and equipment, the Contractor shall properly repair all insulation and seal all openings with vapor barrier covering and vapor barrier adhesive, of types installed with the insulation.

CC. The Architect reserves the right to revise locations of piping and equipment within the building, as long as sizes remain the same. The Contractor should include suitable allowance in his bid price for the above.

DD. In all cases where equipment and materials are specified in the singular or plural number, it is intended that such reference shall apply to as many such items as are required to complete the installation.

EE. Where piping or other equipment passes through fire or smoke barrier stops, walls, floors, or ceilings, this Contractor shall furnish and install sleeves and shall thoroughly seal openings around sleeves, pipes, and equipment with fire and smoke resistant materials. Materials shall be furnished by the Plumbing Contractor as required to maintain the fire rating of the walls, partitions, ceilings and floors in accordance with the requirements of NFPA, the Pennsylvania Department of Labor and Industry, and other applicable codes.

FF. All moving parts of equipment and appurtenances installed shall be properly lubricated by the Contractor.

GG. The Contractor will be responsible for the completion of all work included under this Contract and shall employ skilled and qualified tradespeople as necessary to satisfy all work and trades.

HH. All capped or plugged connections shall be suitable for permanent, gastight installations.

1.3 CODE COMPLIANCE

A. All plumbing work and materials shall comply with all applicable codes. Energy conservation shall be provided for plumbing systems as described in The International Energy Conservation Code.

1.4 ROUGH-IN

A. This Contractor shall verify roughing-in dimensions for all fixtures and equipment prior to roughing-in for such fixtures and equipment.

1.5 SHOP DRAWINGS

A. This Contractor shall submit prints of shop drawings and manufacturers' data for approval in the manner prescribed. Refer to this section for "Required Submittals".

1.6 RESPONSIBILITIES OF BIDDERS

A. Before ordering any material or doing any work, this Contractor shall verify all measurements at the site and shall be responsible for the correctness of same. Any differences encountered

between the site measurements and those shown on the Drawings shall be submitted to the Architect for consideration before proceeding with the work.

B. This Contractor is assumed to be skilled in the trade and is solely responsible for compliance with health and safety regulations, performing the work in a safe and competent manner, and installation procedures required for the work as outlined in these documents.

C. This Contract is all-inclusive of the work indicated on the Drawings and herein specified, and no separate Contract work, supplementary labor or service will be provided by the Owner, except as otherwise noted on the Drawings or herein specified.

D. If any part of the installation specified or shown on the Drawings to be executed under this Contract requires a trade or classification of mechanics other than is normally directly employed by this Contractor, it shall be expressly understood that this Contractor shall sublet or engage mechanics experienced in each explicit trade involved to execute the work for the Contractor.

1.7 SCAFFOLDING AND RIGGING

A. This Contractor shall provide all the scaffolding required to do the work included in this Contract. All necessary precautions must be taken in high risk areas. Provide temporary rigging, as required, to install work.

1.8 DRAWINGS

A. The drawings are intended to be diagrammatic and are based on one (1) manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions, or all the details of the equipment. The Contractor shall verify the actual dimensions of any substituted materials and equipment to ensure that they will fit in the available space. All apparatus shall be located and all pipes run in the manner and locations shown thereon as closely as conditions will permit, and deviations therefrom shall be made only with the consent of the Architect, and without additional charge to the Owner.

1.9 TEN-DAY PRIOR APPROVAL

A. Any equipment or components proposed for this project, other than model numbers named in the bid documents, shall have pertinent submittal data and descriptive cover sheet submitted to the Architect ten (10) days prior to the bid date for inclusion in an addendum, if and when, reviewed and accepted for bidding.

B. This is for prebid review and is not to be regarded as submittals required for construction.

C. Bidder shall base the bid on items of equipment actually named in bid documents or addendums issued prior to bidding. Verbal acceptance will not be recognized unless verified in writing. It is the Bidders' responsibility to ascertain that all equipment has been accepted by requiring copies of the Architect’s written acceptance from the Equipment Suppliers.

1.10 WARRANTIES

A. The equipment and materials manufacturers are expected to recognize that they are responsible for the failure of their products to perform in accordance with data furnished by them or their authorized representatives as well as misrepresentations of such data. When the products have been installed in accordance with the manufacturer's published or written instructions and recommendations and such products fail, then the Contractor and the manufacturers are responsible for replacement of the products and all associated work and materials without additional cost to the Owner. This warranty applies to all items supplied on the equipment and not just those that are the product of the manufacturer.

B. The Contractors' warranty shall include at least two (2) inspections of the system to repair and replace any items found to be defective during this period. The first shall be approximately six (6) months after the acceptance of the system and the second at the end of the first year.

1.11 SHOP DRAWINGS AND SUBMITTALS

A. Refer to Architect's Front End for submittal requirements.

B. At the close of the job, prior to final review, five (5) bound copies of operations and maintenance (O&M) manuals shall be submitted by transmittal to the Engineer for review and acceptance. In lieu of hard copy O&M manuals, the Contractor may submit two (2) copies on CD format containing PDF files. O&M manuals, regardless of format, shall include the following:

1. Equipment warranties.

2. Contractors' warranties.

3. Parts list and manuals for all equipment.

4. Operating instructions (in writing).

5. Written instructions on maintenance and care of the systems.

C. Prior to the installation of any equipment or materials, submit shop drawings and manufacturer's data for the items listed in the Submittal Log (Attachment A) in accordance with the Contract Documents. Submittal Log (Attachment A) shall serve as the Contractor's checklist to assure the complete submission of all required shop drawings and manufacturer's data. Additionally, all equipment and materials furnished as part of this Contract shall be submitted for review regardless of whether it is listed on Submittal Log (Attachment A) or not.

D. The submissions are the Contractor's documents, and the Architect's and Engineer's review or acceptance constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.

E. Any deviations from the design documents must be clearly identified so that the Engineer may properly review such items. It shall not be the Engineer's responsibility to search out these discrepancies. If such changes are not properly flagged for the Engineer's review, the Contractor shall be completely responsible for all consequences said changes may result in on the project.

F. Submit Record (As-Built) Drawings. Refer to Paragraph 3.03

1.12 UTILITIES AND PROTECTION OF SERVICES

A. Do not interrupt any utility or service without adequate previous notice and schedule.

B. The Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or services (underground, overground, interior or exterior) damaged, broken or otherwise rendered inoperative during the course of construction. The material used by the Contractor shall be approved by the Architect.

C. Refer to "Excavation and Backfill" for site underground utility marking strips.

1.13 INSTRUCTIONS TO OWNER'S OPERATING PERSONNEL

A. The Contractor and his subcontractors shall satisfactorily complete the systems so that they are functional and operating to the satisfaction of the Architect. All systems, their controls and their sequencing must be demonstrated to the satisfaction of the Architect.

B. The Contractor shall furnish the services of qualified personnel, approved by the Architect and thoroughly familiar with the completed installation, to instruct the Owner's permanent operating personnel in the proper operation of all systems included under this Contract and the proper care of all equipment and apparatus. These services shall be furnished for a period of two (2) 8- hour days after the operation of the building has been taken over by the Owner.

C. When instructions are provided under this Contract, the Contractor shall have in his possession three copies of an identifying letter which shall list the names of the Contractor's qualified instruction personnel, including manufacturer's representatives and subcontractors that will be giving instructions. Likewise on the same letter, spaces shall be provided for the Owner's personnel who will receive the instructions. After instructions have been given and received for each system, the Contractor's representatives and subcontractors shall sign and date the letter, and the Owner's personnel shall sign and date the letter acknowledging that they have received adequate instructions for operating and maintaining the systems and equipment. One signed copy shall be delivered to the Owner, one copy to the Architect, and one copy shall be retained by the Contractor.

D. It is the intent that the entire systems with their complement of equipment and auxiliary equipment operate properly in accordance with the design concept and functional intent. It is also the intent that the Owner be given complete instructions for the proper operation and maintenance of all systems.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products shall be first-line quality, of grade and type shown on the Drawings, and specified or equivalents accepted by the Architect in writing.

B. All products shall be in current production with no notice having been given that this product is to be drastically changed, modified or discontinued from production.

C. The Supplier, by submitting, certifies that the equipment being proposed is proper for the application intended and that it has the capacity called for on the Drawings or in the Specifications.

2.2 COMPLETE SYSTEM

A. All products, materials, and accessories shall be furnished, and installed as required, for a complete system ready for the Owner's beneficial use.

2.3 EQUIPMENT AND MATERIALS DEVIATIONS

A. When any material or equipment is identified on the drawings or in the Specifications by reference to a manufacturer's name or model number; it is intended to establish a required standard of design and quality; and it is not intended to limit competition.

B. When the Drawings and/or Specifications indicate one or more manufacturers' names for materials or equipment, the Bidder may submit a bid based on materials or equipment of manufacturers not named but considered by the Bidder to be equivalent to the standard of design and quality specified; however, such substitutions must be accepted by the Architect as equivalent. If the Bidder elects to bid on a substitution without securing written consent of the Architect prior to receipt of the bids, then it will be understood that proof of compliance with the

specified requirements is the direct responsibility of the Bidder, and no such materials or equipment may be purchased or installed without written acceptance.

C. Bidders are advised to ascertain such acceptance from their Suppliers by requesting copies of acceptance in writing signed by the Architect from their Suppliers.

D. Where the equipment's electrical characteristics (i.e. horsepower, wattage, voltage, amperage draw, etc.) deviate from the plumbing and/or the electrical design, it is the responsibility of the Plumbing Contractor to strictly coordinate all electrical requirements prior to submittal, to meet the specific electrical requirements without a change order. Confirmation of coordination shall be included with the appropriate submittal. No change orders shall be awarded due to lack of coordination between trades.

2.4 ELECTRICAL WORK FOR PLUMBING EQUIPMENT

A. Electric Motors - All electrical motors furnished and installed under this Contract shall be manufactured by Reliance, General Electric, U.S. Motors, or approved equivalent, and shall be of the proper type and frame of the services involved in accordance with the NEMA and Equipment Manufacturer's recommendations. Motors shall be "energy efficiency" type with 1.15 service factor. Motor windings shall be all copper. Where possible, motors shall be permanently lubricated. Where motors must be lubricated, the manufacturer shall furnish the services of a representative to review the lubrication procedure with the Contractor and the Owner and turn over to both of them all of the necessary maintenance literature. Motors and installation shall conform to all applicable requirements of the National Electrical Code. Motors shall be suitable for across-the-line or reduced voltage starting as applicable in each instance. Furnish the Electrical Contractor with all motor data so the Electrical Contractor may size wiring. The Plumbing Contractor shall be responsible for any additional costs to the Electrical Contractor resulting from any changes in motor sizes initiated by the Contractor, from sizes scheduled on the Drawings. Motors located in conditioned space shall be selected for quiet operation and shall not produce an objectionable "Motor Noise" in the space.

B. Electrical characteristics shall be determined from the Drawings and Specifications and verified on the job.

1. All power wiring by Electrical Contractor; all control wiring by Plumbing Contractor, except as herein specified; refer to "Control Wiring", this section. All power wiring and connections for all motors, including starters, controllers, and breakers will be furnished and installed under the Electrical Contract.

2. In general, rigid conduit or tubing for control wiring shall be used, but equipment that requires movement or that would transmit vibration to conduit shall be wired with flexible (liquid tight) steel conduit, not over eighteen (18") inches long. Provide surface raceways at finish locations.

3. All equipment with control wiring shall be grounded with a green-covered ground wire run inside the conduit and connected to the equipment frame on one (1) end and to grounding system on the other end.

4. All electrical work required in the Contract shall conform to all applicable requirements of Division 16 of these Specifications.

5. The Plumbing Contractor shall employ an approved, licensed Electrical Subcontractor, fully qualified in the trade, to perform all electrical control work required under the Contract.

6. This Contractor shall not run piping above motors, switchboards, or panelboards in accordance with the National Electrical Code, unless specifically indicated on the

drawings to serve that area with fire protection. Before piping is installed, coordinate exact locations with the Electrical Contractor. Failure to comply with this requirement shall be cause for the piping to be removed and relocated at no additional cost to the Owner.

2.5 CONTROL WIRING

A. Furnish and install control wiring as indicated on the drawings or as specified in various portions of the specifications. All control wiring is the responsibility of the Plumbing Contractor, who provides the particular equipment, except as herein specified.

1. The Electrical Contractor will extend control wiring from fire protection monitor (tamper) switches and flow indicators to the fire alarm system.

2. The Electrical Contractor will extend control wiring from the fire alarm panel to the electric alarm bell.

3. Power and Control wiring and conduit from all sump pump junction boxes to sump pumps shall be included under the Plumbing Contract.

4. For all packaged systems of skid-mounted equipment, the Electrical Contractor shall provide a single point power connection to the system. All associated power and control wiring within the packaged system to equipment skid shall be by the Plumbing Contractor. Refer to drawings for specific wiring scopes of work.

5. Electrical Contractor shall provide power wiring to medical alarm panels. All interconnecting wiring from transducers to panels, or panel to panel. Shall be under the Plumbing Contract.

B. Control wiring, in general, shall mean “low voltage” wiring, such as 24 volt, 12 volt, and 6 volt wiring, and shall include the providing of all required motor controls, relays, pilot devices, all related raceway systems, all related conductors, and all final electrical connections other than three phase power connections.

C. For 120V or 277V line voltage equipment provided under the Plumbing Contract, the Electrical Contractor will provide single phase feeders and make final connections.

D. All control wiring shall be extended in conduit. Use "plenum wire" without conduit where runs are in conditioned spaces such as relief, air conditioned, or return plenums.

E. Control wiring shall be run in conduit, and shall be copper conductors provided with Type THHN or dual rated THHN-THWN insulation and protective covering, not less than No. 12 AWG, run in accordance with the National Electrical Code; and in general, conforming to Division 16 specifications for this project.

F. Conduit above ground for control wiring shall be rigid steel conduit or electrical metallic tubing, run in accordance with the National Electrical Code; and in general, conforming to Division 16 specifications for this project.

G. Conduit below ground or below slab for control wiring shall be Schedule 40 PVC, UL rated for 90 degrees C., run in accordance with the National Electrical Code; and, in general, conforming to Division 16 specifications for this project.

2.6 VIBRATION AND NOISE CONTROL

A. Furnish and install vibration isolators, flexible connectors, and other safety measures to prevent noise and vibration from being transmitted to occupied areas.

B. Following installation, make proper adjustments to eliminate excessive noise and vibration.

C. All equipment shall operate without objectionable noise or vibrations within Noise Criteria Curves listed in Sound Control Fundamentals of the latest edition of the ASHRAE Handbook of Systems and Applications. Sound and vibration measurements shall conform to the ASHRAE Handbook of Fundamentals. If such objectionable noise or vibration shall be produced and transmitted to occupied portions of the building by apparatus, piping, or other parts of this work, any necessary changes, as approved by the Architect, shall be made without cost to the Owner. Noise levels shall conform to the requirements of OSHA.

2.7 TAMPERPROOF SCREWS

A. All screws exposed to view on plumbing equipment installed under this Contract, such as on wall access panels, fixtures and trim, floor drains, cleanouts, water coolers, and similar equipment, shall be tamperproof type. Screws shall be vandalproof slot type, Holt head, Allen head, or similar types. Phillips head screws are not regarded as tamperproof.

B. Finish of screws shall match the finish of equipment in which they are being installed.

2.8 ACCESS PANELS

A. The Plumbing Contractor shall furnish factory-fabricated access panels for access to all concealed valves, shock absorbers, air vents, traps, trap primers, strainers, cleanouts, plumbing equipment, fire protection equipment, and other items where no other means of access is available. Access panels shall be of appropriate size but not less than 18", except as otherwise noted on the drawings, flush type, hinged to drop down and out, concealed hinge and vandalproof operated spanner head cam lock, stainless steel in tile work and prime coated sheet steel in plaster or acoustical tile of all types. The Plumbing Contractor shall deliver access panels to the General Contractor for installation. Exact locations of panels shall be determined by the Plumbing Contractor, but panels shall be located for a symmetrical appearance. Access panels are not required at lift-out removable tile ceilings.

B. At locations where indirect waste access is required, access panel doors shall be louvered. Louvered panel doors shall be as manufactured by Cierra Products, or approved equivalent.

C. At locations where access panels are installed in fire-rated construction, access panels shall contain the 1-1/2 hour fire-rated "B" label; and in addition, shall also be provided with layers of gypsum wall board in thicknesses which will supply additional fire ratings equal to the fire ratings of adjacent construction.

D. Coordinate with the General Contractor on fire ratings of construction.

E. Access panels shall be Cierra Products, Acudor, or Zurn.

2.9 SLEEVES AND ESCUTCHEONS

A. The Contractor shall provide sleeves for all piping and equipment passing through walls, floors and foundations. Sleeves, in general, shall be constructed of Schedule 40 steel pipe. Space between pipe and sleeve shall be sealed with a fire stopping material. Sleeves are not required for vertical core-drilled holes (i.e. fixture drainage piping); however, openings shall be filled with firestopping. Sleeves for large sewer piping which may pass through grade beams shall be Schedule 40 PVC. Provide openings through grade beams in accordance with Architect's requirements.

B. All sleeves shall be of sufficient size to allow continuous passage of insulation where required.

C. Where pipe motion, due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe.

D. Sleeve installations in exterior and designated interior walls, foundations and slab on grade floors shall consist of steel sleeves with the annular space between the carrier pipe and sleeve continuously filled with modular, mechanical type, inter-locking synthetic rubber links. Sleeves shall be Model WS and links, Model LS, all as manufactured by LINK-SEAL Division, Thunderline Corporation, Advance Products & Systems, Inc., or Metraflex.

E. Sleeves through fire rated construction shall be sealed as specified under the "Fire Stopping" section of this Specification.

F. Escutcheons, including at fixtures, floor, wall, and ceiling plates, shall be chrome, cast brass, setscrew type. Provide “deep type” escutcheons where required to conceal connections; use split ring backup escutcheons beneath deep escutcheons for extra depth where necessary. For insulated pipes, the escutcheon shall surround the outside of the insulation.

2.10 FIRE STOPPING

A. Seal openings of fire rated construction with a material or product that has been tested at an independent testing laboratory, such as UL, FM, etc. Fire stopping shall conform to ASTM E-814, UL 1479, or UL 2079, with fire ratings equal to or exceeding the fire rating of the construction involved (Refer to General Construction Documents). Fire stopping shall be UL classified, and shall be similar to RectorSeal Metacaulk, 3M brand Fire Barrier Penetration Sealing Systems, or Hilti **DGS –** or equivalent as approved by the Professional. Fire stopping of this type shall also be utilized for openings through smoke/fire rated construction. Refer also to applicable International Building Code Standards.

B. If desired by the Contractor and approved by local codes, the “Hydro Flame” pipe sleeving system will be acceptable, by Presealed Systems, 3M, or Hilti **DGS –** or equivalent as approved by the Professional. Penetration system shall be UL certified, a water/fire stop system, tested to ASTM E814. Flame Through/F-Rating: up to 3 hours. System shall be secure, waterproof, fire rated, smokeproof, protects against gases, prevents mold intrusion, and shall allow for pipe expansion and contraction.

C. If desired by the Contractor and approved by local codes, the "Pro Set" water/fire stop piping penetration systems also may be utilized. Penetration systems shall be UL certified and shall be the "Pro Set" System A, System B, or System C, 3M, or Hilti **DGS –** or equivalent as approved by the Professional

D. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, release agents, water repellents, and any other substances that may affect proper adhesion.

E. Comply with manufacturer’s recommendations for temperature and humidity conditions before, during, and after installation of firestopping.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. All work shall be performed by competent mechanics using proper tools and equipment to produce first-quality work. All work shall be neatly installed, accessible for maintenance, and complete with all accessories required.

3.2 ACCESSIBILITY

A. All equipment shall be installed in such away that all components requiring access (control operators, motors, drives, belts, valves, etc.) are so located and installed that they may be serviced, reset, replaced or recalibrated, etc. by service people with normal service tools and equipment. If any equipment or components are shown in such a position that this Contractor cannot comply with the above, the Contractor shall notify the Architect.

3.3 RECORD (AS-BUILT) DRAWINGS

A. The Contractor shall maintain a complete set of Contract Drawings at the site and shall record all deviations in his work **(in red ink or pencil**) from that indicated on the Contract Drawings. Deviations shall be clearly and accurately recorded so that the Engineer can prepare final record (as-built) drawings using the Contractor's marked-up drawings. Dimensions shall be recorded using permanent reference points such as columns, building walls and like items. These record drawings shall be submitted to the Architect prior to final acceptance.

3.4 FOUNDATIONS AND SPECIAL SUPPORTS

A. For concrete bases for equipment included under this Contract, the Plumbing Contractor shall establish sizes and locations of the various bolts, together with the templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with suitable plate at bottom end of sleeve to hold the bolt. Each piece of equipment designated to have a base shall have a concrete base of not less than four (4") inches high, which shall project four (4") inches on all sides beyond the equipment. Bases shall have greater depths of height where so noted on the drawings. Refer to "Concrete Work".

3.5 CODES, STANDARDS, AND REGULATIONS

A. All materials and workmanship shall comply with all applicable codes, federal and state laws, Specifications, local and county codes and ordinances, industry standards, utility company regulations, NFPA, and NEC. In case of a difference between codes, Specifications, federal and state laws, local and county codes and ordinances, industry standards, utility company regulations, NFPA, and NEC, and the Contract documents, the most stringent shall govern. The Contractor shall promptly notify the Architect in writing of any such difference.

B. Reference to the following codes shall mean:

REFERENCE	DEFINITION
ASTM	American Society for Testing Materials
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electric Manufacturers Association
ANSI	American National Standards Institute
IBC	International Building Code
IPC	International Plumbing Code
NEC	National Electrical Code

C. Should the Contractor perform any work that does not comply within the requirements of the applicable building codes, state laws and federal laws, local and county codes and ordinances, industry standards, utility company regulations, NFPA, and NEC, the Contractor shall bear all costs arising in correcting the deficiencies.

D. This Contractor is assumed to be skilled in the trade and is solely responsible for compliance with OSHA regulations, performing the work in a safe and competent manner, and in installation procedures required for this work. All supervision assigned to this project shall be experienced in this type of work. This Contractor's superintendent shall be designated as

Safety Inspector, unless the Contractor designates another person and notifies the Architect of this change.

3.6 REVIEW BY ARCHITECT

A. This Contractor shall notify the Architect at the following stages of construction so that the Architect may visit the site for review and consultation:

1. When equipment installation starts.

2. When ceiling installation will cover any work not reviewed.

3. When any piping is to be permanently concealed by construction.

4. When any piping is to be permanently concealed by backfilling of trenches.

5. When testing is started.

B. Should the Contractor fail to notify the Architect at the times prescribed above, it shall then be the Contractor's responsibility and cost to expose any concealed piping or demonstrate the acceptability of any part of the system. Any extra cost, caused by the removal of work by other trades, shall be borne by this Contractor, at no cost to the Owner.

3.7 EARLY START-UP

A. This Contractor shall do all possible to see that the plumbing **and fire protection** equipment is connected with electrical power as early as possible, so that final testing can be started. Should this Contractor be ready for operation and power is not available, the Electrical Contractor and the Architect shall be notified.

3.8 CLEANING AND PAINTING

A. At the completion of the project, thoroughly clean all equipment and remove all trash, cartons, and similar debris from the area. Make any necessary corrections or repair/replace any damaged materials or equipment. Leave the entire systems in a thoroughly clean and orderly manner.

B. Where welding of pipe destroys factory pipe coating, piping shall be repainted. Any finished surfaces that have been scratched or discolored shall be touched up or repainted with paint to match the original color, to the satisfaction of the Architect. If any part has been bent, broken or otherwise damaged, it shall be replaced new prior to final review.

C. The following items of equipment and piping being furnished under this Contract shall be prime coated and finish painted by the Plumbing Contractor. Painting shall be in strict accordance with the requirements and recommendations of OSHA.

1. All equipment and piping installed outside the building exposed to weather, including on roof areas. Colors shall be as selected by the Architect. Finish paint cast iron roof drains of color selected by the Architect.

2. All non-galvanized and unpainted support steel, brackets, hangers, and other miscellaneous metals, including in crawl spaces, tunnels, walkways, above ceilings, loft spaces, prefabricated floor trenches, mezzanine spaces, and accessible pipe spaces.

D. Insulated piping is not required to be painted, unless requirements provided by the Owner and Architect. All Piping shall be painted in accordance with Owner and Architect requirements.

Coordinate painting procedures and requirements prior to bidding. Painting of piping may include, but not limited to, the following:

1. All insulated piping and equipment exposed to public view.

2. All uninsulated piping in Mechanical Equipment Rooms.

E. Surfaces required to be finished painted shall be painted as follows:

1. All uninsulated piping shall be painted with one (1) coat of rust inhibitive red primer and one (1) coat of gloss enamel.

2. All other ferrous metals shall be painted with one (1) prime coat of equipment and machinery primer and one (1) finish coat of gloss enamel.

3. Coated cast iron or coated black steel piping need not be painted above ceilings; however, rusted or scraped piping shall be touched up, to keep a like new finish.

4. All galvanized surfaces shall be painted with one (1) prime coat of galvanized steel primer and one (1) finish coat of gloss enamel. All aluminum surfaces shall be painted one (1) prime coat of aluminum primer and one (1) finish coat of gloss enamel. Paint shall be of types specifically made for these surfaces.

5. All other copper and brass surfaces shall be painted with one (1) prime coat of zinc chromate primer and one (1) finish coat of gloss enamel.

F. Color code and/or label all natural gas piping per Gas Company's and/or Owner/Architect's requirements.

G. Color code fire protection piping as specified. Paint exterior fire protection devices including exposed drains, of colors selected by the Architect.

H. Paint shall be of colors selected by the Architect.

I. Finish paint color samples shall be submitted to the Architect for approval.

J. Paint shall be as manufactured by Glidden, PPG, Rust-Oleum, or Sherwin-Williams **DGS –** or equivalent as approved by the Professional.

K. All painting shall be done in a careful, neat and workmanlike manner with particular care being exercised to protect building equipment and finishes. All surfaces shall be thoroughly cleaned of rust, scale, dirt, grease, dust, and like items, and sanded so as to provide bond for new paint. The Contractor shall be entirely responsible for cleaning all surfaces and should evidence appear to the Architect that the surface was not properly prepared, the Contractor shall remove paint, prepare surface and repaint as required at no additional cost.

L. The Contractor shall be responsible for painting his piping and equipment installed in finished areas after these areas have received finish painting by the General Contractor or in areas where the General Contractor is not painting.

M. Refer to "Plumbing Identification", Section 220553, for stenciling and labeling.

3.9 FINAL CONNECTIONS

A. All equipment noted as furnished and installed by other contractors or by the Owner, that requires plumbing services, will be furnished and installed complete with trim by that party, except as herein specified. The Plumbing Contractor shall coordinate type and location of

equipment, rough-in services noted or required and make final connections. Final connections shall include items such as drain tailpieces, “P”-traps, running traps, water, air, and gas shut-offs, interconnecting piping extensions, piping within and around cabinetry, combination waste assemblies where required, piping adapters, and like items.

3.10 MAINTENANCE

A. Contractor shall be responsible for maintenance of all equipment and apparatus included under this Contract until final project completion.

3.11 PLUMBING PLANS

A. The plumbing plans are intended to be diagrammatic and are based on one (1) manufacturer’s equipment. They are not intended to show every item in its exact location, the exact dimensions, or all the details of the equipment. The Contractor shall verify the actual dimensions of any specified or substituted materials and equipment to ensure that they will fit in the available space. All apparatus shall be located as closely as conditions will permit and deviations therefrom shall be made only with the consent of the Architect and without additional charge to the Owner. The right is reserved by the Architect to make any reasonable changes in the location of the equipment prior to rough-in without invoking additional expense to the Owner.

3.12 QUESTIONS AND CLARIFICATIONS OF BID DOCUMENTS

A. **Bidders shall not rely on any verbal clarification of the drawings and specifications. Any questions or clarifications shall be referred to Engineer at least seven (7) working days prior to bidding to allow for issuance of an addendum.**

3.13 CHANGE ORDERS

A. If change orders are not justified or rejected repeatedly by the Architect and the Owner, the Contractor shall be required to reimburse the Architect and the Engineer for time spent in excess of eight (8) hours to review change orders that are not justified.

3.14 SUBSTITUTIONS

A. Throughout the Specifications, types of materials may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the bidder may assume the phrase "or approved equivalent," except that the burden is upon the bidder to prove such equality. If the bidder elects to prove such equality, he must request the Architect's approval in writing to substitute such item for the specified item, and shall submit supporting data, and samples if required, to permit a fair evaluation of the proposed substitution with respect to quality, serviceability and warranty. All data pertinent to the proposed substitution shall be submitted to the Architect at least 10 days prior to the bid date for evaluation and review purposes. If the Architect accepts the proposed substitution, an addendum will be issued to all bidders advising all bidders that this substitution will be acceptable from all bidders.

B. Substitutions of equipment other than that specified must be very carefully checked to assure that no problems will occur due to dimensional differences, code requirements, connection points, weights, etc. Where the Contractor elects to substitute materials or equipment approved by the Architect for those specified, the Contractor will be held responsible for all architectural, structural, mechanical, and electrical changes required for the installation of the substituted materials at no additional cost to the Owner. All tests required to substantiate the equivalence of the material will be the obligation of the Contractor.

C. When this Contractor desires to furnish equipment of a manufacturer other than that specified or intended, he shall include a complete specification of the substituted item, along with each submission copy of shop drawings, indicating the necessary modifications to the substituted product to satisfy the requirements of the Contract Specifications. Manufacturer's specifications shall be written as close as possible over the Contract Specifications and each paragraph shall bear the same paragraph number as the Contract Specifications so that close comparison can be made. All submissions will be rejected should they not include the comparison specification. Comparison specification shall be submitted for approval 10 days prior to the Bid Date. If prior approval is not obtained, no substitutions will be considered and the Engineer reimbursed for time spent to reject and return such submission.

D. The verification specification shall include the exact wording of the Contract Specification and the revised wording identified properly indicating all the deviations proposed. If no deviations are noted, the Contractor must furnish the material or equipment in accordance with the Contract Specifications.

E. Should the Contractor elect to propose a substitution after the project has been awarded, the Contractor will be billed for the time spent by the Architect and his consultants in evaluating the proposed substitution. This billing shall occur whether the proposed substitution is accepted or rejected and shall be at the rate of the direct cost to the Architect times a 2.5 multiplier.

F. The submissions are the Contractor's documents, and the Architect's and Engineer's approval constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.

3.15 COORDINATION FOR CONTRACTORS

A. The Contractor must arrange work to eliminate conflictions with work of other contractors. It is extremely important that fire protection piping not be installed unless directly coordinated with the HVAC Contractor's ductwork installations and other contractor's piping and equipment installations.

B. Actual location of pipe and equipment shall be determined at site. IN GENERAL, ROUTINGS OF THE HVAC CONTRACTOR SHALL TAKE PRECEDENCE. Contractor shall confer with other contractors as to locations of pipes, ducts, electrical and equipment provided under their contracts, before erecting any work. In case of confliction, the Architect shall have the final decision, with no cost to Owner.

C. Contractor shall furnish Electrical Contractor information on electrical requirements of equipment provided under Contract. Equipment connections shall be made in neat and workmanlike manner, placing equipment in proper operating condition, with provisions for maintenance or replacement. Equipment manufacturer's recommendations shall be followed for final connections.

3.16 FLASHINGS

A. The General Contractor will furnish and install all new roof flashings for roof drains and vents. Roof gas pipe flashing will be completed in a similar fashion. The Plumbing Contractor shall provide wall and floor flashings as specified. All existing roof flashing shall be under this Contract.

B. For interior floor drain installations and concrete slab concealment in above-floor slab locations, epoxy concrete grout shall be used as manufactured by Nor-Mar Enterprises, F-101 Ease-A-Crete, or approved equal. Refer to Drawing Details.

3.17 EXCAVATION AND BACKFILL

A. The excavation shall be unclassified. All excavation shall mean the removal of all materials necessary to obtain proper grade for all piping and work installed under the Contract.

B. Unless noted otherwise in these Specifications, trenching shall be excavated 6" below pipe invert and backfilled with thoroughly mechanically tamped crushed stone having a maximum size of 1/2". After the work has been inspected and/or tested, the excavation shall be backfilled around and up to 12" over the pipes with the same material as pipe bedding. The balance of the excavation/trenching shall be backfilled as follows:

1. Exterior seeded areas – Backfill shall be clean, unfrozen earth free of stones larger than 2". Backfill shall be up to the top soil level on seeded area excavation.

2. Exterior paved areas – Backfill shall be 2RC stone up to the level of the pavement stone base.

3. Interior Areas – Backfill shall be 2RC stone up to the level of the pavement stone base.

4. In all cases, backfill shall be thoroughly mechanically tamped and placed in layers not exceeding 6" in depth. Compact each lift until a dry density is obtained, which is equal to or exceeds 95% "Proctor" for pavement areas and building slab on grade areas; 90% "Proctor" elsewhere. Maximum dry density shall be obtained by testing a representative sample of fill in accordance with ASTM D-1557. Submit laboratory test reports which shall indicate compliance with these Specifications. Tests shall be performed at the following locations and frequencies, or as otherwise directed by the Architect:

   a. Paved and building slab on grade areas: In no case fewer than three (3) tests- at subgrade and at two (2) selected compacted fill and backfill layers.

   b. Foundation wall backfill: In no case fewer than two (2) tests – at compacted initial and final backfill layers.

   c. Trench backfill: In no case fewer than two (2) tests-at compacted initial and final backfill layers, at least one test for each 150 feet or less of trench length.

5. Special excavation and backfilling will be required for underground acid piping systems. Refer to Sections 15100 (221300) and 15220 (221415).

6. For underground gas service piping, included under this Contract, interior, exterior, furnish and install 6" of fine, clean, unfrozen, natural river sand all around piping- under, along side of, and on top of piping. Backfill to grade as specified herein.

7. Provide a 6" wide detectable metallic caution type foil marking strip for each exterior underground utility line installed under this Contract, continuously, all locations. Marking strip shall be a minimum of 12" below finished grade, except 6" below subgrade under pavements and slabs; color coded, with appropriate applicable wording. Marking strip shall be as manufactured by Seton Name Plate Company, Brady Co., or MSI Services. Marking strip shall be placed before finished grading procedures and shall be directly coordinated with site utility marking strips provided by others.

   a. Provide above marking strip over outside edges of the underground grease interceptor vault, underground acid neutralizing tank containment basin, and similar locations.

C. The excavation shall be kept free of water. No piping, equipment or concrete shall be installed in water. The Contractor shall provide necessary pumping and drainage for the protection of the installation.

D. All excavation or trenching which occurs under wall foundations shall be backfilled up to the level of the wall foundation using concrete as herein specified.

E. Where ground is found to be unsuitable to support pipe, provide concrete cradles. When laying pipe in concrete cradles, deposit concrete full width of cradle continuously to bottom of pipe, before concrete is set, embed pipe evenly, deposit remainder of concrete and tamp in a manner to avoid disturbing pipe. Provide concrete bridging in trenches in roadways in strict accordance with utility company or sewer authority requirements.

F. Any information on utilities, surface or sub-surface structures, roadways, piping or conditions presented on the contract drawings does not guarantee that these utilities, surface or sub-surface structures, roadways, piping or conditions shall be exactly as illustrated and described. It is the Contractor's responsibility to obtain and/or verify such information prior to construction in order that he may provide an installation in complete conformity with design intent of the project.

G. The Contractor shall maintain the work safe to human life and property in conformance with all Local, County, State and Federal Safety Regulations.

H. Any structures and existing services damaged in the course of the work shall be repaired by the Contractor in kind equal to or surpassing the existing installation.

I. For all exterior plumbing site work in public highway, street, or right-of-way, it is the Plumbing Contractor’s responsibility. The Contractor shall make all necessary arrangements with appropriate governing or municipal agency, make repairs, provide concrete, obtain and pay for all permits, inspection fees, tapping fees, obtain approvals and all other incidental costs of work, relative to work under this Contract. Include the use of flagpersons for continuous movement of traffic in roadways.

J. All excess excavation material shall be removed from the site, properly and legally disposed of, at an approved land fill area, unless arrangements are made with the Owner for on-site disposal.

K. For all exterior plumbing site work included under this Contract, the Plumbing Contractor shall restore and/or replace all paving, sod, turf, sidewalks, roadways, driveways, road base courses to match existing, shrubs, gutters or other disturbed surfaces to a condition equal to, or surpassing that before the work began and to the satisfaction of the Architect and the Owner and shall furnish all labor and material incidental thereto. Include all necessary raking, seeding, and fertilizing.

3.18 SPECIAL ENGINEERING SERVICES

A. In the instance of Mechanical and Control systems, such as all major and special equipment, controls, or similar miscellaneous systems and equipment, the installations, final connections and testing of such systems shall be made under the direct supervision of competent authorized service engineers who shall be employed by the respective equipment manufacturer and/or an authorized representative. Any and all expenses incurred by these equipment manufacturers' representatives shall be borne by the Contractor.

3.19 TESTS AND ADJUSTMENTS - GENERAL REQUIREMENTS

A. The Contractor shall furnish all labor, material, and equipment necessary for performance of all tests required by any of the agencies having jurisdiction. Testing procedures shall be outlined hereinafter under the respective sections of these specifications.

B. All tests shall be conducted in the presence of the Architect. No piping shall be concealed until the system has been approved.

C. At the completion of the work, all equipment, valves, fixtures, fixture trim, mixing valves, regulators, hose bibbs, wall hydrants, sprinkler heads, etc., shall be adjusted for proper operation.

D. The Contractor shall obtain certificates of approval, acceptance and compliance with regulations of all agencies having jurisdiction. Work shall not be deemed complete until such certificates have been delivered to the Architect.

3.20 CONCRETE WORK

A. Furnish and install all concrete work related to work included under this Contract. Construct concrete forms and bases for the equipment installed under this Contract. Bases and forms shall be of suitable dimensions for all equipment. All concrete work shall be constructed subject to the approval of the Architect.

B. Bases shall be reinforced with 6 x 6 x #10 gauge wire mesh unless detailed otherwise and anchored through floor construction with 3/4" diameter bolts or rods. Anchor bolts for equipment shall be placed in base before equipment is set.

C. Concrete shall attain a minimum compressive strength of 3,300 psi at the age of 28 days, unless otherwise specified or indicated on the Drawings, such as for manufacturer's precast concrete construction. Tests shall be made by an approved laboratory if in the opinion of the Architect the concrete is not satisfactory. All costs in connection with tests of concrete shall be borne by the Contractor.

D. All materials used for plain and reinforced concrete and the measuring, mixing, handling, placing and curing shall conform to current specifications of the American Concrete Institute (ACI 304 and ACI 318-71). Cement shall be normal Portland cement, Type I or Type II, conforming to ASTM Designation C-150.

E. Aggregates shall consist of sand of approved quality, crushed stone, and washed gravel conforming to ASTM Standard Specification Designation C-33, and shall be supplied from a source approved by the Architect. The maximum size of the aggregate shall be no larger than 1/5 of the narrowest dimensions between forms of the members for which the concrete is to be used, no larger than 3/4 of the minimum clear spacing between reinforcing bars. All water for concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

F. Slag in any form will <u>not</u> be permitted as an aggregate.

G. Proportions shall be in accordance with American Concrete Institute Standard "Recommended Practice for the Design of Concrete Mixes ACI 211.1."

H. Metal reinforcement shall be deformed steel bars, cold-drawn steel wire, or fabricated forms of these materials. All bars shall be deformed, intermediate grade new billet steel. These materials shall conform in quality to Standard Specifications of the American Society for Testing Materials of the following applicable titles and serial designations:

<u>Bars</u>

Billet-Steel Bars for Concrete Reinforcement_____A 615
Rail-Steel Bars for Concrete Reinforcement_____A 616

<u>Wire</u>

Cold Drawn Steel Wire for Concrete Reinforcement_____A 82

Fabricated Materials

Fabricated Steel Bar Mats for Concrete Reinforcement_____A 184

Welded Steel Wire Fabric for Concrete Reinforcement_____A 185

I. Forms shall be of steel or wood and shall conform to the shape, piping, grades and dimensions of the concrete. All formwork shall comply with ACI 347. They shall be sufficiently tight to prevent leakage of mortar and shall be properly braced and tied together so as to maintain the desired position and shape during and after placing concrete. Forms shall be removed in such a manner as to assure the complete safety of the structure. All exposed corners or edges shall be chamfered. All burrs, fins, irregularities of forming, or spillage shall be removed and the surface float or trowel finished to a smooth straight surface.

J. Concrete shall be integrally waterproofed with Rez-Seal, by Euclid Chemical Company, or approved equivalent additive.

K. Water stops of plastic, as manufactured by Ryerson, or approved equivalent, shall be installed in all concrete joints and between pours.

L. Any new piping routed below new or existing foundations shall be encased in concrete. Concrete shall extend a minimum as follows: to the underside of the foundation wall, on 1’-0” on each side of the interior and exterior foundation walls, and 1’-0” below the pipe. Concrete below piping shall be set on 2’-0” of 2RC, or equivalent, stone base.

3.21 MISCELLANEOUS IRON WORK

A. Furnish and install all miscellaneous iron work including, but not limited to, piping hangers, piping anchors and guides, and all other equipment supports. All additional structural members shall be furnished and installed to support equipment without excessive stress or strain on the building construction. Structural beams and other structural members shall be furnished and installed under this Contract where the building steel is not available or capable of supporting or anchoring pipe piping and equipment.

B. All equipment and materials furnished and installed under this Contract which are not mounted on bases or floors shall be securely attached and supported from the main supporting structure of the building by metal hangers, clamps and/or brackets. Metal hangers, clamps and/or brackets shall be of suitable design and of sufficient strength to properly and safely support the materials and equipment involved. Lag screws and bolts shall be used where required at wood construction.

C. Materials - Structural steel members for the support of equipment installed under this Contract shall conform to ASTM Specifications A-36 and shall comply with the latest requirements of the American Institute of Steel Construction. Structural steel shall be of standard sections as given in the structural steel manufacturers' handbooks.

D. Priming - All steel and iron work shall be primed with Rust-Oleum red primer, Glidden, PPG, Sherwin-Williams, or approved equivalent. Before priming, all metal shall be thoroughly cleaned free from scale, rust, and dirt.

E. Anchors - The Contractor shall provide all anchors, bolts, screws, dowels, and connecting members and do all cutting and fitting necessary to secure the work to adjoining construction. Build in connecting members to masonry, concrete, and structural steel as the work progresses.

F. Supports and Brackets - Supports and brackets shall be neatly constructed of structural shapes to adequately support the equipment intended. All supports must be approved prior to installation. Field conditions will regulate the type of support.

G. Drain Pan Construction - The Contractor shall construct a drain pan with outlet, at location shown. Provide a continuous 22 gauge galvanized, aluminum, or stainless steel pan sloped off level to drain outlet. Keep drain outlet clear of electrical equipment. Pan sizes are approximately as shown on the drawings; however, exact sizes shall be determined at the site by the Contractor. Pan sides shall be 4" high minimum, with continuously welded seams. Anchor straps to structure every 48", or as otherwise required for smaller lengths. Paint interior and exterior of galvanized or aluminum pan construction.

1. Furnish and install in drain pan, a water sensing unit, the Dorlen Products Model SS-5 "Water Alert" sensor (Tele. No. 414-282-4840), Water Gard, Inc., or The Water Alarm.

2. The sensor shall be activated by any liquid bridging two (2) adjustable sensors. The unit shall be factory adjusted to activate with 1/32" water film height. Sensor shall include an on-off action buzzer mounted in unit and DPDT isolated relay contacts, battery-operated (2). Alarm duration, ten (10) days. The sensor shall reset when water subsides. Nine volt (9V) batteries by Plumbing Contractor. Unit shall include a three (3) year manufacturer's warranty.

3. Provide water alert sensor cable for length of drain pan. Interconnect sensor cable to alarm as recommended by Manufacturer.

4. Control wiring from sensor to DDC System will be provided by the Automatic Temperature Control Contractor.

3.22 COORDINATION DRAWINGS

A. Coordination

1. Each Contractor shall familiarize himself with the drawings and specifications of all other contracts relating to this project and shall coordinate with, and be held responsible for his Work which is affected by or dependent on, other contracts.

2. Each Contractor shall provide any dimension, coordination, sleeve, insert, embedded or built-in item, and/or information which is required to be built into, or to complete, the work of another contract in a manner consistent with the Approved Project Schedule. Any additional cost or delay damages arising from a contractor's failure to so furnish or provide shall be borne by that contractor.

B. Coordination Drawings and Procedures

1. Each Contractor shall prepare composite shop drawings and field installation layouts for his work as directed by the Architect to solve tight field conditions except as modified in Paragraph 3 below. Such drawings shall consist of dimensioned plans and elevations and shall give complete information, particularly to size and location of sleeves, attachments, openings, conduits, ducts, boxes and structural interferences.

2. These composite shop drawings and field installation layouts shall be coordinated in the field among the Contractors to verify the proper relationship to the work of other Contractors based on field conditions, and shall be checked for accuracy and approved by the Contractors as directed by the Architect before submission to the Architect for final approval.

3. HVAC, Plumbing, Fire Protection and Electrical Work shall be coordinated as indicated by the following procedure. Each Contractor shall sign each coordination drawing after all work has been laid out and conflicts resolved. The preparation of coordination drawings and layout Work on the coordination drawings shall be performed at the site by each Contractor.

   a. The HVAC Contractor shall prepare a drawing of each area, at a scale of 1/4 inch equal 1'-0", showing his work plan and elevation. The Architect/Engineer can provide CAD Backgrounds of the entire project to the HVAC Contractor for his use. The HVAC Contractor shall layout and show light fixtures on the drawings.

   b. The drawings referred to in 3. a. above shall then be forwarded to the next succeeding Contractor for layout of their work in the field in the following order: (a) PLUMBING (b) FIRE PROTECTION; (c) ELECTRICAL; (d) INTERIOR CONSTRUCTION.

   c. By use of color coding, each succeeding Contractor shall show his work on the referenced drawings and shall sign same to indicate his satisfaction that there is no interference between his work and that of other Contractors. Colors will be assigned by the Architect.

   d. When all work has been shown and signed off, the HVAC Contractor shall forward each to the Architect for review and approval.. Prints of approved transparencies shall be distributed to the Contractors by the Architect.

   e. The Architect shall print one copy for each trade for use in the field.

   f. The color coded drawings shall be kept at the Architect's field office for future reference in the event of conflict between the trades. At the completion of the project, all color coded drawings shall be delivered to the Owner for his records.

C. Meetings

1. Coordination meetings to resolve interferences in the Work will be held at the site in an area to be provided by the Architect. Representatives of each Contractor shall be present at each meeting. Each Contractor shall provide all necessary resources to insure that the coordination process described herein does not delay the Approved Project Schedule.

D. Each Contractor acknowledges that there may be items of Work which have not been drawn, coordinated, clarified or specified with complete detail in the Contract Documents but which are required for the completion of the Work, as inferable from the Contractor Documents. Any such item, when identified as part of the development of the Work, shall be drawn, coordinated, clarified or specified by the Architect in a manner consistent with contemplated kind, quality and customary standards and provided to the Contractor. When such drawing, coordination, clarification or specification is approved by the Owner, the drawing, coordination, clarification or specification so approved shall thereupon be part of the Contract Documents and the item of Work shall be performed by the Contractor as part of the Work without further action or order of the Owner and without any increase in the Contract amount or time as if such drawing, coordination, clarification or specification were originally included in the Contract Documents.

3.23 COORDINATION DRAWINGS – UNDERGROUND WORK

A. Prior to the start of construction, this Contractor shall prepare and submit to the Architect a complete set of reproducible drawings indicating the routings, sizes, and invert elevations of all underground plumbing piping and fire protection piping crossing through, under, above, and/or otherwise affecting subsurface footings and grade beams.

B. Drawings shall be prepared in the same scale as the Architectural structural plans, and shall illustrate all relevant foundation and underground plumbing piping and fire protection piping.

C. Elevations and subsurface foundation crossings indicated on the Plumbing Contract Drawings are intended to assist the Contractor in developing his Bid Proposal. Specific dimensions, sleeve sizes where applicable, and elevations shall be determined by the Contractor shown on his Coordination Drawings.

3.24 MERCURY PROHIBITION

A. The use of mercury as a component of any equipment installed as part of this work is strictly prohibited. Mercury substitutes shall be used in thermometers, switches, and other equipment, which might commonly contain mercury.

3.25 ACOUSTIC SEALING

A. Seal openings of acoustic-rated ceilings, walls, floors, or other construction, or acoustic area separation requirements with a material or product specially made for these types of applications. Acoustical sealants shall be as manufactured by Arcat, Inc., Acoustical Surfaces, Inc., or American Acoustical Products. Refer to Architectural Drawings for acoustic sealing locations required.

3.26 CLEARANCE REQUIREMENT

A. Ceiling areas directly below heating equipment must be kept clear of all piping, conduit, and other utilities, including fire protection components, to allow for unit access for servicing and/or removal. Refer to “Contractor’s Specific Note” shown on the drawings.

END OF SECTION 220500

Submittal Log (Attachment A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

No.	Specification Number	Description	Manufacturer	Date Received	Action Taken	Date Returned
	15051 - 220500	O&M Manuals				
	15051 - 220500	As-Built Drawings				
	15051 – 220500	Pipe Specialties (Fire Wrap, Access Panels, etc.)				
	15061 - 220529	Plumbing Hangers and Supports				
	15076 – 220553	Plumbing Identification Labels				
	15081 – 220700	Plumbing Insulation				
	15100 – 221300	Manholes / Catch Basins				
	15100 – 221300	Utility Piping of all types				
	15100 – 221300	Meter Vault				
	15100 – 221300	Utility Site Valves				
	15111 – 220523	Domestic Water Valves				
	15111 – 220523	Domestic Hot Water Return Balancing Report				
	15140 – 221116	Domestic Water Piping and Fittings				
	15140 – 221116	Treated Water Piping and Fittings				
	15140 – 221116	Plumbing Heat Trace				
	15140 – 221116	Domestic Water Pipe Accessories (strainers, gauges, etc.)				
	15140 – 221116	Prefabricated Floor Trenches				
	15140 – 221116	Domestic Water Treatment System				
	15150 – 221316	Sanitary and Vent Piping and Fittings				
	15150 – 221316	Sanitary Drains of all types				

Submittal Log (Attachment A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

	15150 – 221316	Sanitary Cleanouts of all types				
	15150 – 221316	Trap Primers / Trap Seals				
	15150 – 221316	Interceptors of all types and sizes				
	15160 – 221413	Storm Piping and Fittings				
	15160 – 221413	Storm Drains of all types				
	15160 – 221413	Storm Cleanouts of all types				
	15160 – 221413	Downspout Boots				
	15160 – 221413	Secondary Drain Termination w/ splashblocks				
	15160 – 221413	Foundation Drainage Pipe and Fittings				
	15160 – 221413	Condensate Vertical Check Valve				
	15190 – 221125	Pool Piping, Fitting and Valves				
	15191 – 221124	Natural Gas Piping and Fittings				
	15191 – 221124	Natural Gas Valves				
	15191 – 221124	Natural Gas Regulators				
	15191 – 221124	Kitchen Solenoid Valve				
	15191 – 221124	Science Room Emergency Shut-Down System				
	15211 – 221416	Air Compressor				
	15211 – 221416	Compressed Air Piping and Fittings				
	15211 – 221416	Compressed Air Outlets				
	15211 – 221416	Compressed Air Valves				
	15211 – 221416	Compressed Air Regulators				

Submittal Log (Attachment A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

	15211 – 221416	Compressed Air Hose Reels				
	15220 - 221415	Acid Drainage Pipe and Fittings				
	15220 - 221415	Acid Drains of all types				
	15220 – 221415	Cleanouts of all types				
	15220 – 221415	Acid Neutralizing Tanks				
	15300 – 221420	Complete Fire Protection System				
	15400 – 224000	Plumbing Fixtures and Trim – Complete				
	15440 - 221429	Hot Water Circulating Pumps				
	15440 – 221429	Sump Pumps with Controls				
	15440 – 221429	Domestic Water Booster Pump System				
	15440 – 221429	Sewage Ejector with Controls				
	15440 – 221429	Domestic Water Well Pump & Storage Tank				
	15480 – 223300	Domestic Water Heating Boiler with Storage Tank				
	15480 – 223300	Domestic Water Heaters & Accessories				
	15555 – 226313	Medical Air Compressor				
	15555 – 226313	Medical Vacuum Pump				
	15555 – 226313	Medical Gas Manifolds				
	15555 – 226313	Medical Gas Pipe and Fittings				
	15555 – 226313	Medical Gas Valves				
	15555 – 226313	Medical Gas Outlets				
	15555 – 226313	Medical Gas Zone Valve Boxes and Alarm Panels				
	15998 – 226408	Seismic Requirements				

SECTION 220523 – DOMESTIC WATER VALVES

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 SCOPE

A. The valves for the domestic water systems shall be as hereinafter described in this section.

B. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% per Safe Drinking Water Act as amended January 4th 2011 Section 1417. Valve requirements to meet all State and Local requirements.

C. **For fire protection system valves, refer to Section 221420.**

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 for ferrous valve dimensions.

2. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set angle, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL USE VALVES

A. The domestic water supply system shall be fitted with valves at points specified or indicated on the Drawings. Provide minimum 3/4" hose end drain ball valves with vacuum breakers and threaded caps at all low points of the water system to provide for drainage.

B. Lead Free silicon bronze (ASTM listed) valves shall be made with corrosion-resistant materials. Manufacturer shall provide third party certification tested in accordance with EN ISO 6509 regarding dezincification corrosion resistance and stress corrosion cracking.

C. Valves 2" and smaller shall be Bronze Valves, ball type, with threaded or solder ends, unless otherwise indicated. Valves 2-1/2" and larger shall be Ferrous Valves, butterfly type, with flanged ends, unless otherwise indicated.

D. All valves for general use shall be Nibco Inc., Hammond, Milwaukee, Apollo, Stockham, Zurn, Wilkins, or Watts. All valves shall be designated for a minimum 125 pounds per square inch (S.W.P.), 200 pounds per square inch (W.O.G.).

E. Bronze or brass valves, including check valves and balancing valves, shall be made to be "dezincification resistant", with metal components in the waterway, or not containing more than 15% zinc in their chemical makeup.

F. The name or trademark of the manufacturer and the guaranteed working pressure shall be cast or stamped on the body, as well as 'Lead Free' marked handle.

G. Valves in Insulated Piping: With 2-inch stem extensions:

1. Ball Valves: With extended operating handle of non-thermal-conductive material that meets UL 2043 approved for inside air plenum, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

    a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO NIB-SEAL (-NS suffix in figure no.), handle extension or approved equal.

2. Butterfly Valves: Shall have 2" extended neck for insulation clearance.

H. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Grooved: With grooves according to AWWA C606.

3. Solder Joint: With sockets according to ASME B16.18.

4. Threaded: With threads according to ASME B1.20.1.

5. Copper Press: With sockets according to ASME B16.22/ASTM B75

I. Bronze Ball Valves

1. Two piece, full port, silicon bronze ball valves with the capability of accepting extended operating handles. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S/PC-585-80-LF (-NS).

    a. Standard: MSS SP-110 and ASME A1124.14

    b. CWP Rating: 600 psig

    c. Body Design: Two piece bronze with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.

    d. Body Material: Silicon bronze (ASTM Listed), corrosion resistant.

    e. Ends: Threaded, soldered or pressed.

    f. Seats: Reinforced PTFE or TFE.

    g. Ball & Stem: Silicon Bronze 'Lead Free' Material

    h. Port: Full.

2. Three-Piece, full port, silicon bronze ball valves with the capability of accepting extended operating handles. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-595-Y-66-LF (-NS)

    a. Standard: MSS SP-110 and ASME A1124.14.

    b. CWP Rating: 600 psig.

    c. Body Design: Three piece bronze with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.

    d. Body Material: Silicon bronze (ASTM Listed), corrosion resistant.

    e. Ends: Threaded or soldered.

    f. Seats: PTFE or TFE.

    g. Ball & Stem: Stainless steel.

    h. Port: Full.

J. Ductile Iron, Single-Flange Butterfly Valves

1. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc: Basis-of-Design Product: Subject to compliance with requirements (NSF/ ANSI 61 and/or NSF/ANSI 372), provide NIBCO Model LD-2000N-3/5.

    a. Standard: MSS SP-67, Type I.

    b. NPS 12 and Smaller CWP Rating: 200 psig

    c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

    d. Body Material: ASTM A 536, ductile iron.

e. Seat: EPDM.

f. Stem: One-piece stainless steel.

g. Disc: Lead Free Aluminum bronze.

K. Ductile Iron, Grooved-End Butterfly Valve

1. 300 CWP, Iron, Grooved-End Butterfly Valves with EPDM Disc Basis-of-Design Product: Subject to compliance with requirements (NSF/ANSI 61 and/or NSF/ANSI 372), provide NIBCO Model GD-4765N-3/5.

a. Standard: MSS SP-67, Type I.

b. NPS 10 and Smaller CWP Rating: 300 psig

c. NPS 12 CWP Rating: 200 psi

d. Body Material: Polyamide Coated, ductile iron ASTM A 395.

e. Stem: Two-piece stainless steel.

f. Disc: EPDM-Encapsulated, ductile iron.

g. Seal: EPDM.

2.2 CHECK VALVES AND BACKFLOW PREVENTERS

A. For condensate drain line “light spring” check valves, refer to Section 221413, “Condensate Drain System”.

B. Silicon Bronze Lift Check Valves

1. 200 CWP, Lift Check Valves with Nonmetallic TFE Disc. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-480-Y-LF.

a. Standard: MSS SP-139

b. CWP Rating: 200 psig

c. Body Design: Vertical or Horizontal Flow

d. Body Material: Silicon Bronze (ASTM Listed), corrosion resistant.

e. Ends: Threaded or Soldered.

f. Disc: FTE

C. Silicon Bronze Swing Check Valve

1. 300 CWP, Bronze Swing Check Valves with Nonmetallic TFE Disc. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-413-Y-LF.

a. Standard: MSS SP-139

b. CWP Rating: 300 psig

c. Body Design: Vertical (flow in upward direction) or Horizontal Flow

d. Body Material: Silicon Bronze (ASTM Listed), corrosion resistant.

e. Ends: Threaded or Soldered.

f. Disc: PTFE or TFE

D. Iron Swing Check Valve

1. Class 125, Iron Swing Check Valves with Metal Seats. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F-918-LF.

a. Standard: MSS SP-71, Type I

b. CWP Rating: 200 psig

c. Body Design: Clear of full waterway

d. Body Material: ASTM A 126, gray iron

e. Ends: Flanged.

f. Trim: Stainless Steel or Silicon bronze (ASTM listed), corrosion resistant.

g. Gasket: Asbestos free.

E. Double Check Valve Backflow Preventers

1. For sizes ¾" thru 2", Wilkins Model 350XL-S-FT, 'Lead Free', with full port quarter turn ball valves, integral male 45 degree flare SAE test fitting, Watts or Apollo. Valve shall include lever handle ball shutoffs, replaceable seats and seat discs, and test cocks. A stainless steel backflow preventer will be acceptable.

2. For sizes 2-1/2" thru 12", Wilkins Model 350-FS-OSY, 'Lead Free', 'Lead Free', OS & Y gate valves, Watts or Apollo. Unit shall have ductile iron body, stainless steel internals, and EPDM seal ring. Wilkins Model 350AST will be acceptable.

3. Dual Check Valves 1/4" thru 3/8", for equipment or ice machine supply piping, shall be Watts Series "Lead Free", Wilkins, or Apollo, of 316 stainless steel body, corrosion-resistant, internal rubber components. Valve shall be certified to ANSI/NSF Standard 18, Manual Food and Beverage Dispensing Equipment. Provide strainer ahead of either installation.

4. Ice Maker, Check Backflow Preventer shall be all "Lead Free" bronze body, the Watts, Wilkins, or Apollo with plastic check modules, silicone discs, Buna-N seals, and stainless steel springs. Provide strainer ahead.

2.3 DOMESTIC WATER SYSTEM VALVES

A. Balancing Valves: Balancing valve shall B&G Circuit Setter series and equipped with an integral flow meter. Valve shall be brass body with brass ball. Flow meter shall be brass body with stainless steel flow meter springs. Flow meter shall have indicator cover and accuracy rated at ± 10 %.

B. Hydrants

1. WH-1 - Exterior Wall Hydrants: Zurn No. Z1300-CL Series, encased Ecolotrol "anti-siphon" automatic draining wall hydrant for flush installation, Josam, Smith, Wade, or Watts. Complete with non-freeze type integral backflow preventer, bronze casing, all bronze interior parts, non-turning operating rod with free-floating compression closure valve, replaceable bronze seat and seat washer, 3/4" inlet/outlet, and key-operated control valve. Nickel-bronze box and hinged cover with cylinder lock and "WATER" cast on cover. Nickel-bronze cover with polished face. A stainless steel wall hydrant will not be acceptable. Mount wall hydrants with centerline 2'-0" above finished grade.

2.4 PRESSURE REDUCING VALVES

A. Pressure reducing valves of sizes 2-1/2" and smaller shall be of bronze construction, the Watts Series LF223 or LF223S as required.

B. Pressure reducing valves of 1” size and smaller shall be Watts Series LFN45B-EZ-M1, bronze construction, lead free, with standard bypass feature.

C. Furnish and install a strainer ahead of each pressure reducing valve, of type specified. Reducing valve with integral strainer will be acceptable.

D. Comparable pressure reducing valves as manufactured by Apollo, Spirax-Sarco, Watson McDaniel, will be acceptable.

E. Provide a pressure gauge on inlet and outlet of each pressure reducing valve.

2.5 POINT-OF-USE MIXING VALVES

A. TMV-1 - Individual thermostatic point-of-use mixing valves shall be provided at each sink, lavatory, bank of fixtures, or other appliance requiring hot water. Mixing valves shall be Powers # LFLM495. Valve shall be of brass and bronze body construction, ‘Lead Free’, minimum flow rate, .5 GPM; brass and stainless steel flow control components, vandal-resistant temperature handle adjustment, integral checks/strainers, rough bronze finish, and wall mounting bracket. Mixing valve shall conform to ASSE 1070. Bradley, Lawler, or Symmons, shall also be acceptable. Each valve installed must meet fixtures/equipment’s maximum flow rate. Coordinate with fixture/equipment supplier prior to submittal.

1. For other locations, set outlet temperatures of mixers as shown or as otherwise directed by the Owner.

2. Furnish and install shutoff valves on inlet and outlet piping of each mixing valve. Refer to the mixing valve schedule and piping schematic shown on the drawings.

2.6 STOPS

A. Each plumbing fixture furnished under this Contract and each piece of special equipment furnished under other contracts or by the Owner shall, unless otherwise shown or specified, be provided with compression stop valves on the water supply piping. On copper or PEX piping, ball valves shall be installed on branch water piping to equipment. Stops shall be finished brass, chrome-plated where exposed and shall be provided with stop control as shown or specified.

2.7 RELIEF VALVES

A. Relief valves shall be ASME, pressure relief type or combination temperature/pressure relief type, as manufactured by Watts, Kunkle, or Apollo. Extend each relief valve outlet to nearest funnel/floor drain or safe waste.

PART 3 – EXECUTION

3.1 INSTALLATION

A. All valves must be accessible.

B. Provide a shutoff valve at the base of upfed water risers and at the top of downfed water risers with a minimum 3/4" hose end ball drain valve with vacuum breaker and threaded cap at the base of all water risers.

C. Each piece of equipment that may have to be removed from the system for repair shall be connected by union or flange, and provided with isolation valves.

D. Provide a shutoff valve on water supply to each exterior wall hydrant, regardless of whether shown or not.

E. Upon installation, all testable backflow preventers shall be tested under the Plumbing Contract, in accordance with manufacturer's installation standards, or in accordance with local authorities or utility company having jurisdiction over the installations. All testing shall be completed by persons certified in this type of work. All costs, fees, or charges required for testing shall be included in the Contract price.

END OF SECTION 220523

SECTION 220529 – PLUMBING HANGERS AND SUPPORTS

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 SCOPE

A. The hangers and supports for the various plumbing **and fire protection** systems shall be as hereinafter described in this section.

B. Hangers and supports shall be arranged to distribute the weight of the piping and equipment uniformly on the building structure.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. All pipe hangers, riser clamps, and supports shall be as manufactured by The Modern Pipe Supports Corp., Anvil International, Inc., Tolco Co., or Erico Corp. The following catalog numbers are taken from The Modern Pipe Supports Corp. Catalog to indicate the type of installation required.

B. Hangers for steel, iron, or plastic piping shall be The Modern Corp. Government ring type hanger, No. 404, complete with band hanger, Fig. No. 540 malleable iron adjuster and rod, or approved equivalent. Hanger bands shall be flat and suitable for application of insulation over the hanger and pipe.

C. Hangers for all copper piping shall be The Modern Corp. No. 48, complete with copper-plated band; No. 121 copper-plated, malleable iron adjuster, and rod, for pipe sizes ½” thru 6”, or approved equivalent. PVC coated or epoxy coated hangers will be acceptable. Use The Modern Corp. No. 10, with special PVC coated or padded band, and Fig. No. 540 copper plated, malleable iron adjuster, and rod, for pipe sizes larger than 6”.

D. Insulation shall be installed over band hangers and all openings shall be sealed.

E. If clevis or loop hanger systems are utilized, insulation shields must be installed to maintain uniform insulation thickness and maintain insulation material characteristics.

F. Hanger rods installed in conjunction with hangers shall be not less than 3/8" for pipe sizes 1/2" to 2"; 1/2" for pipe sizes 2-1/2" and 3"; 5/8" for pipe sizes 4" and 5"; 3/4" for 6" pipe; and 7/8" for 8" to 12" pipe sizes. Hanger rods shall be larger where recommended by the hanger manufacturer.

G. Piping 2" and smaller supported on steel joists shall be hung from one joist with beam clamps. Piping over 2" and 3" in diameter shall be suspended from 1-1/4" steel pipe or steel angle, laid-in and hook-bolted to the web members of the joists. Piping 4" and 5" shall be supported from three joists. Piping 6" and over shall be supported from not less than four joists.

H. Piping along walls shall be supported on substantial wall hangers securely attached to construction by means of inserts or expansion sleeves and bolts. Wall hangers shall be similar to Modern Corp. Fig. No. 284, or approved equivalent.

I. All expansion shells shall be of the self-drilling types, as manufactured by the Phillips Drill Company, Ramset, Rawlplug, or approved equivalent. Shells shall be hammer installed, special flush or hanger rod types. Shells shall be installed with a drill-hammer. Lead expansion shields or lead wedge type shields will not be permitted.

J. Vertical runs of exposed uninsulated piping shall be supported from walls with sections of Modern Corp. Chan-All channel-strut and strut clamps, or approved equivalent. For all insulated piping, use strut clamps sized to permit a continuous insulation installation.

1. "Klo-Shure" insulation couplings will be acceptable, as represented by Scott Industrial Systems (Tele No. 412-965-3279).

K. All supports directly in contact with copper piping shall be copper-plated, PVC coated, or epoxy coated, or equivalent. Ferrous metals shall not be used in contact with copper piping. Hangers for copper tubing 6" and smaller shall be copper-plated, PVC coated, or epoxy coated as herein specified; PVC coated or padded hangers for larger copper piping.

L. Hangers for pipe and tubing, **except for fire protection piping**, installed horizontally, shall be spaced, at a maximum, as follows:

PVC AND COPPER PIPE SUPPORT SPACING

Pipe Size	PVC, FT	Copper, FT
Up to 1-1/2"	3	6
2" and Larger	4	8

STEEL PIPE SUPPORT SPACING

Pipe Size	Drainage Service, FT	Air & Gas Service, FT
1"	7	9
1-1/2"	9	12
2" & 2-1/2"	10	13
3"	12	15
4" & 5"	14	17
6"	17	21
8"	19	24
10"	22	28

PEX AND CORRIGATED GAS PIPE SUPPORT SPACING

Pipe Size	PEX	CORRIGATED GAS
Up to 1"	32"	32"

M. All vertical runs of piping shall be supported at each floor and/or at specified intervals, by means of riser clamps. Copper tubing shall be protected against electrolysis, such as copper plating, PVC coating, or epoxy coating, or approved equivalent. Supports shall be placed at

minimum ten (10) foot intervals for vertical pipe, except as otherwise dictated by NFPA recommendations for fire protection piping.

N. Where concentrated loads of valves, fittings, etc., occur, closer spacing may be necessary. Smaller pipe shall be provided with additional supports to prevent piping from sagging. Hangers must be installed not more than 12" from each change in direction of pipes.

O. Where cast iron pipe is suspended, a minimum of one (1) hanger shall be provided for each length of pipe at each fitting.

P. Brass chromium plated pipe shall be supported by suitable cast brass, chromium plated supports. All securing devices shall have all exposed heads, finished chromium plated.

Q. Pipe hangers and hanger spacing for the fire protection systems shall conform to NFPA recommendations. Hangers for the fire protection system shall be UL Listed, FM approved. Hangers shall be adjustable type pattern.

R. Hangers for PEX water piping shall be as follows:

1. Horizontal runs shall be supported in accordance with manufacturer's installation instructions. Vertical runs shall be supported at every floor. Protect pipe with steel plates where necessary. Provide for expansion and contraction. Protect tubing during storage.

S. All pipe runs 3" or larger connected to mechanical equipment in Boiler Room and Chiller Room, shall be mounted with steel spring isolators. The first three pipe hangers in the main lines near the mechanical equipment shall be Mason Industries Type PC3ON, Anvil, Tolco, or Erico. Horizontal runs in all other locations shall be isolated by Mason Industries Type 30N hangers, Anvil, Tolco, or Erico. Floor supported piping shall rest on restrained mounts, Mason Industries Type SLR, Anvil, Tolco, or Erico. The first three hangers or mounts near the mechanical equipment shall have the same static deflection as specified for the mountings under the connected equipment. All other hangers and mounts shall have a minimum static deflection of 3/4".

2.2 PIPE PORTALS

A. For pipe penetrating the roof, Contractor shall use Pipe Portal from Portals Plus, or approved equivalent. The Pipe Portal shall include an 18 gauge galvanized roof curb Model 32000 series, with integral base plate, continuously welded corner seams, factory-installed wood nailer, and 1.5" 3lb rigid fiberglass insulation.

B. Pipe Portal shall be furnished with a laminated, acrylic coated, ABS plastic curb cover with prepunched holes and molded sealing ring on an 8" collared opening.

C. An EPDM compression molded cap model C-212 shall be utilized.

D. All Caps shall include Portals Plus' stainless steel Snaplock Clamps.

E. Attachment and installation of the Pipe Portal shall be done in accordance with Portals Plus' instructions and the roofing membrane manufacturer's recommendations.

2.3 SEISMIC SUPPORTS

A. Being of seismic region, furnish and install all necessary additional bracing, brackets, hangers, and supports to effectively install the piping systems. Refer to Section 15998 (226408).

PART 3 – EXECUTION

3.1 INSTALLATION

A. All piping shall be supported from the building construction by the use of fixed or adjustable beam clamps, concrete inserts, lag bolts and lag screws from wood construction, brackets, extension rods, adjustable band ring pipe hangers, or other equipment as dictated by the type of building construction.

B. The Contractor shall place all hanger and support inserts in concrete. Special studs "shot" into concrete will not be permitted.

C. Perforated band iron, strap, split ring, wire, chain, or pipe hooks will not be permitted for hangers or supports of pipe.

D. Piping shall not be supported from any other piping systems, ductwork, conduit, etc. Piping shall only be supported by code approved and manufacturer recommended hanger systems connected directly to the building's structure.

E. ALL hanger and support locations shall be coordinated and reviewed with the Architect, Structural, HVAC, Electrical and **Fire Protection** Engineer Construction Representatives during construction. If any hanger locations or connection methods are unacceptable to any of the professional team (for example – penetrations of pre-cast concrete tees, from piping, uneven spacing or height, etc.), the Contractor shall relocate the support, at his own expense, to an approved location.

F. Attachments to, and penetrations of new or existing concrete structural tees for hanger connections **shall be not be permitted** until reviewed and approved by the Architect. The Contractor shall be responsible for the expense of all repairs required as a result of the installation of unauthorized attachments to, or penetrations of new or existing concrete structural tees.

G. Trapeze type hangers may be used for multiple parallel line installations. The Contractor shall submit sketches for the proposed hangers indicating the type of construction, number and size of piping, and maximum spacing to the Architect for approval. Include metal shielding for insulation to rest thereon to avoid crushing. Insulation must be continuous as specified. Electrolysis at pipe/hanger must be prevented.

3.2 UNACCEPTABLE HANGER AND SUPPORT INSTALLATIONS

A. It is unacceptable to support any pipe(s) or duct(s) from other pipe(s) or duct(s).

B. If unistrut is used to support piping, strap hangers are unacceptable since they do not allow for continuous insulation.

C. It is unacceptable for this Contractor to support his work from the hangers of other trades. All trades must install their own hangers.

D. Unacceptable hanger and support installations shall be corrected as directed by the Architect/Engineer at no cost to the Owner.

END OF SECTION 220529

SECTION 220553 – PLUMBING IDENTIFICATION

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.

PART 2 – PRODUCTS

2.1 EQUIPMENT IDENTIFICATION, VALVE TAGS

A. Where valves, cleanouts, **flow switches, tamper switches, transducers,** and similar equipment is located above removable tile ceilings or above access panels, the Contractor shall furnish and install identification labels on the corners of the access panels or removable ceiling tiles. Labels shall be provided with the words "VALVES," "CLEANOUT," **"FLOW SWITCHES," "TAMPER SWITCHES", "TRANSDUCERS",** and similar wording, so that the equipment may be readily located in the future.

B. Identification labels shall not exceed 3" in length and 1" in height. Black letters shall be 1/8" high on white background. Labels shall be manufactured of engraved Micarta or Bakelite with pressure-sensitive backing and shall be nonabsorbent, nonporous and colorfast. Adhesive backing shall be chemically compounded to hold tight and fast at wide temperature extremes. Labels shall be as manufactured by Seton Name Plate Company, Brady Co., MSI Services. Labels shall be additionally secured with screws or rivets. Flexible plastic punched tapes will not be acceptable. Labels shall be coordinated with those being installed under other contracts. All piping and equipment, insulated and uninsulated, shall be labeled under this contract.

C. All major pieces of plumbing **and fire protection** equipment shall include, at a suitable and accessible observation point on the equipment, a manufacturer's stamped brass or aluminum identification plate, with all pertinent capacity data stamped on the plate. Identification plate shall include all specific data, such as model number, serial number, motor data, horsepower, capacities, sizes, amperes, power consumption, speed, flows, temperatures, working pressures, operating pressures, and similar factors as applicable. In addition, pumps shall include total head in feet and impeller sizes.

D. The Contractor shall be responsible for furnishing and attaching an identification plate for the above mentioned major equipment if not provided by the equipment manufacturer.

E. Equipment marking tags shall be engraved phenolic, 1/16" thick, and four edges binded, black with white lettering. The tag shall be securely mounted to the equipment. Tags shall be as organized per the Equipment Schedules, and include "date of installation and project number."

F. The installations will not be considered acceptable unless identification plates and nameplates are attached.

G. All piping and equipment insulated and uninsulated, installed throughout this Contract, shall be stenciled with the name of the service and with an arrow indicating the direction of flow. Temperature of hot water systems shall also be included. Pressure of Natural Gas system shall be included. **Air pressure shall be indicated on Shop and fire compressed air piping.** Stenciling in exposed locations in finished areas must be coordinated with the Architect prior to installation.

H. Stenciled letters shall, in general, be plain block style, about 1" high, black, and shall be located near each branch connection, at each valve, at each change in direction, on each side of walls or floors, and at least every 30' on straight runs of pipe. On smaller runs of piping, center the designations. In lieu of stenciling, snap-around pipe markers by Seton Nameplate Co. "Set Mark," Brady, MSI Services, may be utilized. Identification and colors shall comply with ANSI A13.1. Snap – around markers shall be suitable for exterior use where utilized.

I. Where pipes are adjacent to each other, markings shall be neatly piped up. All markings shall be located in such a manner as to be easily legible from the floor. Markings on black pipes shall be white.

1. Markings on fire protection piping in exposed areas, such as equipment rooms and storage rooms, shall be yellow on "all red" piping; in finished areas, fire protection pipe colors shall conform to Architect's requirements for painting. Wet and dry systems shall have different markings.

J. Valves in Teachers' desks for water control to Science, Chemistry, Biology, Physics, and similar areas shall be lockable and shall be tagged "Student Use-Water Supply". Valves in Students' desks shall be lockable. Refer to Section 15191 (221124) for similar tagging of gas valves.

K. All labeling, color-coding, and identifying marks for all new piping and equipment shall match existing building's identifications patterns. Coordinate all labeling with Owner and Architect prior to start of work.

2.2 VALVE DIRECTORY

A. The Contractor shall prepare a type written valve directory (and required copies) showing the number, location, use and normal position of valves installed under the Contract. Tag each valve controlling mains and branches, but not individual shutoff or local control valves on fixtures and equipment. Valve directory shall be a white print schedule enclosed in metal frame with glass front.

B. Each valve listed in the directory shall have a corresponding number 1-1/2" diameter brass or aluminum tag attached to the valve by means of a brass or aluminum "S" hook or chain. Numbers and code letters shall be as large as possible for identifying each service. **Valve tags for plumbing and fire protection shall have different designations.** Natural gas valves **and shop or fire protection compressed air** valves shall also be tagged. Numbers and tags shall be coordinated with those being installed under the HVAC Contract. Valve tag numbers shall not be repetitious.

C. Provide two (2) additional copies of valve schedules in a hardback binder to the Owner.

2.3 ELECTRICAL EQUIPMENT LABELS

A. All electrical equipment and items consisting primarily of electrical components shall bear a label of an independent testing laboratory, such as Underwriters' Laboratory (UL).

PART 3 – EXECUTION

3.1 INSTALLATION

A. Valve directory shall be installed at the location designated by the Architect.

END OF SECTION 220553

SECTION 220700 – PLUMBING INSULATION

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 SCOPE

A. The plumbing pipe insulation shall be as described in this section.

1.3 CODE COMPLIANCE

A. All insulation materials and installation procedures shall be in accordance with the minimum requirements of The International Energy Conservation Code.

PART 2 - PRODUCTS

2.1 INSULATION

A. Furnish and install insulation for the following piping systems and equipment. All insulation and insulating materials, except as herein specified, shall be as manufactured by Knauf, Owens-Corning Company, or Manville. Insulation adhesives, sealers, cements, mastics, and other similar items, except as herein specified, shall be manufactured by HB Fuller, Mon-Eco, Childers, or Vimasco. Same type insulation materials shall be used consistently throughout the entire installation. Thicknesses shall be 1", except for Electric Water Cooler and Ice Machine Branch Drain Piping, which would be ½".

B. Materials: All materials shall conform to the following:

1. Piping insulation shall be "heavy density," 1-piece molded fiberglass with factory applied type ASN/SSL "All Service" jacket with self-sealing lap. Average thermal conductivity shall not exceed .25 BTU-in. per square foot per degrees Fahrenheit per hour at a mean temperature of 75 degrees. Thickness shall conform to schedule for pipe size and service as specified herein.

2. Vapor-barrier jacket for the fiberglass system shall be white kraft paper bonded to aluminum foil and reinforced with glass fiber, and pressure sensitive, self-sealing lap adhesive conforming to the physical properties listed in next paragraph.

3. The fiberglass insulating system, including insulation, jacket adhesives, mastics and cements, shall have composite fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723, not exceeding: Flame Spread – 25, Fuel Contributed – 50, Smoke Developed – 50.

4. Fittings for the fiberglass system shall also be 25/50/50 rated as described in the preceding paragraph.

5. All products or their shipping cartons shall have label affixed indicating smoke and flame ratings.

C. Installation: Piping Systems

1. Insulation shall be applied on clean, dry surfaces after pressure testing and approval. All insulation shall be continuous, including through wall and ceiling openings and sleeves. Insulation on piping systems shall be maintained with a continuous unbroken vapor seal. Hangers, supports, anchors, guides and equipment shall be insulated and vapor sealed to prevent condensation.

2. All covered pipe shall be located a sufficient distance from walls, other pipes, ductwork, and other obstacles to permit the application of the full thickness of insulation specified; and if necessary, extra fittings and pipes shall be used.

3. All fiberglass insulation shall be installed with Bostitch outward clinched staples, one (1) every 3" and four (4) at each butt strap.

D. Fittings: Fiberglass systems operating below 60 degrees F: Fittings, valves, unions, and flanges shall be insulated with a fiberglass blanket, 1 pound per cubic foot density wrapped firmly under compression (minimum 2:1) to a thickness equal to the adjoining insulation, secured with No. 20 gauge galvanized annealed steel wire and given a smoothing coat of "asbestos-free" insulating and finishing cement and a vapor barrier sealer. Roof drain bodies and overflow roof drain bodies shall be insulated with fiberglass same as above.

E. Fiberglass systems Operating Above 60 Degrees F: Fittings, valves, unions, and flanges shall be insulated and finished with "asbestos-free" insulating and finishing cement to a thickness equal to the adjoining pipe insulation.

F. Services: All adhesives used for gluing insulations and insulating jackets shall be vermin and mildew-proof. The use of flour paste is prohibited.

G. Insulated fitting covers, as manufactured by Zeston, Proto, or Speedline will be acceptable for the fiberglass system.

H. Where new piping is connected to existing piping, and the insulation is removed, the piping shall be reinsulated and made continuous with the existing insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. This Contractor shall furnish and install non-conducting covering on the following piping and apparatus installed under this Contract. For performing and completing this work, this Contractor shall employ an Insulation Subcontractor specializing and experienced in commercial covering work, responsible to the Plumbing Contractor.

B. The following work shall be insulated under the Plumbing Contract:

1. Complete domestic water distribution systems, exposed and concealed. Insulate water piping installed within and around cabinetry and casework. Insulate water meters, backflow preventers, pressure reducing valves, and strainers.

2. Circulating piping factory furnished by the heater manufacturer between hot water heater and storage tank, including valves, fittings, unions, and flanges, shall be insulated in the same manner as specified for domestic water piping.

3. Insulate inlets and outlets of trap primers, and outlets of trap primer distribution units. Insulate bottoms of distribution units.

4. All capped water piping with valves arranged for future extension shall be insulated.

5. Condensate drain piping, this Contract, exposed, concealed, including check valves.

    a. Where condensate drain piping terminate over floor drains above floor level under the HVAC Contract or the Plumbing Contract, insulate the vertical and horizontal branch sanitary drain line from floor drain to a horizontal point approximately 10' from the floor drain. Insulate entire vertical and horizontal branch run from floor drain if less than 10'.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. All exposed hot, cold, and drain piping below fixtures for ADA usage shall be insulated, Zurn, McGuire, or Truebro, vandal-resistant as possible. Include insulation of P-Trap. Refer to Section 15400 (224000).

E. Application of insulation materials to piping and fittings shall be done in strict accordance with the manufacturers' recommendations. Where thickness of insulation is not specified, use applicable thicknesses recommended by the manufacturer for the specific use. Piping and equipment exterior shall be clean and dry and approved tests shall be completed before any insulation is applied.

END OF SECTION 220700

SECTION 221116 – DOMESTIC WATER PIPING

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 SCOPE

A. The domestic hot, cold, and hot water return water piping shall be as hereinafter described in this section.

B. Refer to Section 220523 for interior water valves.

PART 2 – PRODUCTS

2.1 DOMESTIC WATER DISTRUBUTION PIPING INSIDE BUILDING

A. Interior domestic water piping above floor level shall be hard drawn copper tubing, Type "L", in accordance with ASTM B-88, with solder joint type wrot copper fittings. Copper tubing manufactured by Cambridge-Lee, Cerro, Mueller, Summit, or approved equivalent. Fittings by Nibco, Cambridge-Lee, Mueller, or approved equivalent.

B. Interior domestic water main piping above floor level, 1-1/4” and larger, shall be hard drawn copper tubing, Type "L", in accordance with ASTM B-88, with solder joint type wrot copper fittings. Copper tubing manufactured by Cambridge-Lee, Cerro, Nibco, Summit, or approved equivalent. Fittings by Nibco, Cambridge-Lee, Mueller, or approved equivalent.

C. All exposed piping and fittings at fixtures shall be polished chrome plated.

D. The use of any of the above listed materials shall be subject to the acceptability of that material with the prevailing local codes and utility company regulations. All water line installations shall conform with the requirements of the local Water Authority serving the building.

2.2 JOINTS AND CONNECTIONS

A. Joints in underground ductile iron water pipe shall be cement lined mechanical joint. Fittings shall be cement lined. Gasketed "push-on" type joints may be employed if acceptable to the Water Authority. Joints for piping installed aboveground or inside building shall be flanged, meeting AWWA C115.

1. Coordinate exterior piping terminal ends with the General Contractor.

B. Fittings shall have the minimum chemical and physical properties as described in AWWA C-900 for the class specified. Standard laying lengths shall be 20' for all sizes. A maximum of 15% of the pipe may be furnished in random lengths of not less than 10' long.

1. Fittings shall be of either ductile iron or cast iron construction. PVC water pipe shall have the same outside diameter as being assembled directly into a cast iron or ductile iron bell or fitting.

2. The rubber ring suitable for cast iron or ductile iron fitting or bell shall be used in jointure, NOT the PVC rubber ring.

3. Fittings shall be lined and coated as specified.

4. Coordinate exterior piping terminal ends with the General Contractor.

C. Joints in underground copper piping shall be with silver soldered fittings or flared (compression) fittings, coated. Fiega ProPress System of mechanical joint copper tubing assembly will be acceptable, Nibco Press System, or approved equivalent. Nibco/Victaulic Permalynx System of mechanical joint copper tubing assembly will be acceptable.

D. Joints in above-floor copper piping shall be assembled with lead-free solder using a non-corrosive flux. All copper tubing and fittings 2" and larger shall be tinned prior to making solder joint. All solder joints on tubing 2-1/2" and larger shall be made with the use of a circular flame torch. To be considered “lead free”, solder and flux must not contain more than 0.2% lead.

1. For copper piping 2" and larger, a Type "L" copper grooved mechanical coupling system will be acceptable, Victaulic, Gruvlok, or approved equivalent. Use valves as specified only.

2. For copper piping 4” and smaller above floor level, the Viega ProPress System of mechanical joint copper tubing assembly will be acceptable, Nibco Press System, or approved equivalent. The ProPress System shall consist of an electro-hydraulic pressure crimping tool, with sets of interchangeable crimping jaws, and ProPress special copper fittings. The fittings shall include an O-sealing ring, and shall require no torches, solders, flux, or special pipe burnishing or preparation. A permanent, watertight seal is made by crimping the fittings. Rated at 200 psi; tested to 600 psi. The systems shall be installed in accordance with manufacturer’s installation instructions and governing code requirements. Pipe supports shall be installed so that interior horizontal piping is in uniform alignment.

3. All screw joint copper pipe shall be made with flake graphite and oil or other approved pipe compound applied to the male threads only and screwed tight with not more than 2 threads on the finished joint exposed, and where pipe and fittings are chrome plated, all threads shall be concealed.

E. Suitable adapters shall be used when necessary for connection to fittings, valves, or other accessories having threaded ends.

2.3 ELECTROLYSIS CONTROL

A. The installation of copper piping shall be accomplished in such a way as not to touch or come in contact in any way with ferrous metal. Where copper tubing, piping, or fittings are anchored, supported or may come in contact with metal construction, an insulating non-conductor spacer similar to lead, rubber, fiber or plastic shall be installed to assure prevention of electrolysis.

B. Hangers supporting copper tubing shall be all copper, copper-plated or be large enough to accommodate the insulating pipe covering. Copper tubing piping shall not be (even temporarily) supported or secured to ferrous metal.

C. Connections between ferrous and copper piping shall be with dielectric fittings, Watts, Wilkins, Clearflow, or approved equivalent.

2.4 WATER HAMMER ARRESTORS

A. Furnish and install at high points on domestic water risers, two (2) stories and above, automatic washers, dishwashing equipment, at kitchen booster heater, quick-closing valves, and where

otherwise required, Zurn Z1700, Josam, Smith, Wade, or Watts, factory-made water hammer arrestors, or approved equivalent, of stainless steel or minimum Type “K” or Type “L” copper. Vertical or horizontal pipe air chambers constructed by the Contractor will not be permitted.

B. Arrestors shall be certified, constructed, and tested in accordance with the recommendations of the Plumbing and Drainage Institute Standard PDI-WH-201 and shall bear their seal of approval.

C. Provide shocks associated with solenoid or other quick-closing valves serving heavy equipment, such as laundry machines. Shock shall be controlled by the installation of Zurn Z1712 Accumutrol water hammer arrestors, Josam, Smith, Wade, or Watts. Shocks shall be complete with floating stainless steel spherical piston, bronze surge chamber, valve, and gauge assembly.

D. Use PVC or stainless steel water hammer arrestors for distilled or deionized water systems.

2.5 AUTOMATIC AIR VENTS

A. Automatic air vents (air eliminators) for hot water systems shall be brass, rated 150 psig, the Spirax-Sarco 13WS, Dole, or Hoffman, installed where shown or required. Provide valve on inlet piping to each air vent.

2.6 STRAINERS

A. Backflow preventers, **except for fire protection backflow preventers**, shall include strainers ahead, integral or separate.

B. All other strainers shall be cast bronze, “Y” type, tapped for closure plug; plug by Contractor; 20 mesh, Type 304 stainless steel screen, (3” – 3/64” perforated screen; 4” – 1/8” perforated screen), 200 psi WOG, minimum, the Watts No. 777S or No. S777S, Apollo, Watson McDaniel, or Spirax.

2.7 GAUGES / THERMOMETERS

A. Thermometers shall be non-mercury type, the Weiss Instruments DVU 35 Digital Read-Out, or approved equivalent, Trerice or Ashcroft, mounted on V-shaped aluminum 9” scale with bold black piping and numerals on white background. Range -50 degrees F. to 300 degrees F. Connection assembly shall include swivel nut. Scale size, 2 degrees. Accurate to ± one scale division. Brass 3½” stem. Each thermometer shall be installed in a stainless steel or brass separable socket.

1. Thermometer Test Wells (thermowells) shall be Weksler Model 2SL, Trerice, or Ashcroft.

B. Pressure gauges for domestic water systems shall be Weiss Instruments DUGY3 Digital Read-Out, or approved equivalent, Trerice, or Ashcroft, 4-1/2” dial, 0 – 1000 psi scale, stainless steel case, and bronze bourdon tube. Gauges of 6” dial type shall be the Weksler BA16, or approved equivalent, aluminum, Style “A”, same scale, bottom outlet. Each gauge shall be installed with a Weksler Type A10, brass, 1/4” N.P.T., “T” handle gauge cock and Weksler No. WG42 brass, 1/4” N.P.T. snubber-filter, or equivalent.

1. Pressure gauges for the fire protection system shall be of type as specified with that system; refer to Section 221420.

2.8 FILTERS

A. Plumbing Contractor shall furnish and install water pipe filters where indicated on the drawings. Filters may be wall mounted. Water filters shall be taste-odor-sediment filter, Everpure, CUNO, Ametek. Provide six (6) spare filter cartridges for each filter to the Owner. Filters must be placed in accessible locations for cartridge replacement.

PART 3 – EXECUTION

3.1 WATER DISTRIBUTION

A. All piping shall be installed in spaces and adjacent to other surfaces with sufficient clearances to permit air relief of the hot water system. Air venting valves shall be installed at all trapped high points in the hot water piping. Air venting valves shall be as specified.

B. The water systems included under this Contract, interior and exterior, shall be thoroughly flushed upon completion of the installations. Clean out all strainers. **Flushing of exterior combination domestic water/fire service main piping included under this Contract shall conform to NFPA 24 requirements.**

3.2 INSTALLATION OF PIPING AND VALVES

A. Wrapping threads or caulking screwed connections for tightness is prohibited. No horizontal piping shall be built-in or buried in partitions. No piping shall be erected over any motors, panelboards, switchboards, or other electrical equipment **unless specifically indicated on the drawings to serve that area with fire protection.** Bending of piping will not be permitted; fittings for change of direction shall be utilized. All vertical piping shall be run plumb. All overhead horizontal piping and vertical piping in finished areas shall be concealed, except as otherwise indicated on the drawings.

B. Cut pipe accurately to measurements, and ream free of burrs and cutting splatter. Carefully align and grade pipe and work accurately into place. Fittings shall be used for any change in direction. Make adequate provisions for expansion and contraction. Install anchors to prevent pipe movement. Provide for expansion at every building expansion joint.

C. All buried pipe for underground service piping shall be installed to prevent any movement or blow-out of fittings due to pressure surges in the line. Provide concrete thrust blocking at all turns in the underground piping systems and restraining rods or other methods of support for piping included under this Contract, especially at building entrances, as directed by the Water Authority. Thrust blocking shall be installed at all tees, plugs and bends deviating from the straight run in excess of 15 degrees. Blocking shall be placed between the fitting to be anchored and solid, undisturbed earth. The entire installations shall conform with Water Authority requirements. Confirm requirements prior to bidding.

D. Protect open pipe ends to prevent trash from being placed in the piping during installation. Clean all dirt and cutting debris from pipes before making the next joint.

E. Small pipe shall be screwed or soldered as required to produce a tight system with full joints and no leaks. Pipe joints showing seepage and drips shall be dismantled and remade in proper way, as required for a substantial installation.

F. Copper pipe shall be carefully reamed back to full inside diameter and the mating surfaces shall be cleaned by brush or sandpaper. When clean, the paste flux shall be applied and the joint evenly heated and soldered. Any fittings discolored by heat shall be removed and replaced.

G. All valves to be soldered into piping shall be dismantled to prevent the heat from destroying packing and seats.

H. Valves installed in threaded or flanged piping shall be properly supported and pipes carefully installed to prevent damage or distortion of the valve.

I. Grooved pipe shall be carefully prepared and all burrs removed inside and outside the pipe. The proper lubricant shall be applied and the gasket carefully placed prior to tightening the clamps to the correct torque.

J. Install minimum ¾" ball valve drains with vacuum breakers and threaded caps at every low place and air vents at every high place. Pipe shall slope as shown on the Drawings or in the Specifications. If slope is not shown or specified, slope in the direction of flow one (1") inch per every forty (40') feet.

K. Install pressure gauges, thermowells, and thermometers as specified or shown in details on the Drawings.

L. All valves must be accessible.

M. Extend each air vent outlet and relief valve outlet full size to nearest funnel/floor drain or safe waste.

3.3 CLEANING AND TREATING OF PIPE SYSTEMS

A. Every pipe system shall be cleaned to remove trash, mill scale, cutting oil, welding, and burning splatter from the piping before any control devices are installed. If such debris has collected in valves, the valves shall be disassembled and cleaned prior to closing for the first time.

B. Brush and clean work prior to concealing, painting, and acceptance. Perform in stages if directed by the Architect.

C. Clean and repair painted exposed work, soiled or damaged, to match adjoining work before final acceptance.

D. After several hours of operation, each strainer shall be blown down. This shall be repeated as often as necessary to produce a clean discharge from the blowdown. Prior to turning the system over to the Owner, each strainer shall be cleaned, removed if necessary for this requirement.

3.4 INSTALLATION AND TESTING PROCEDURES

A. All domestic water distribution piping included under this Contract shall be hydrostatically tested to a pressure of one and one-half times the normal system pressure or 150 psi, whichever is greater, and maintained for a period of 2 hours with a pressure loss of not more than 5 psi. The exterior water distribution system included under this Contract shall be installed and tested in compliance with the local Water Authority. Confirm requirements prior to bidding.

B. The Plumbing Contractor shall provide an interior flange connection for the Fire Protection Subcontractor. Coordinate type of flange with the Fire Protection Subcontractor. Final connections by the Fire Protection Subcontractor.

3.5 DISINFECTION OF WATER SYSTEM

A. Before being placed in service, all water piping, interior and exterior, included under this Contract, shall be chlorinated to the satisfaction of the Architect.

B. Prior to chlorination, all dirt, foreign matter shall be removed by a thorough flushing.

C. A water mixture of hypochlorite solution shall be applied by means of a solution-feed device.

D. Treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. This period shall be at least 3 hours and preferably longer as may be directed.

E. After the chlorine treated water has been retained for the required time, the chlorine residual at the pipe extremities and at other representative points shall be at least 5 parts million.

F. Following chlorination, all treated water shall be thoroughly flushed from the newly installed piping at its extremities until the replacement water throughout its length shall, upon test, be equal to the water quality served from the municipal water supply system.

G. Should the initial treatment, in the opinion of the Architect, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show the water sampled from the newly installed piping conforms to the requirements.

3.6 EXPANSION COMPENSATION

A. Pipe installations shall allow for expansion due to temperature differences. Provide expansion offsets in piping where necessary to control expansion.

B. Provide for expansion at every building expansion joint.

C. Separate expansion joints shall be a braided bronze or stainless steel flexible pipe connector, as manufactured by Flex-Hose Co., Inc., Flexonics, or Flexible Metal, Inc., suitable for water service. Expansion joints must be accessible.

3.7 BRANCH PIPING TO FIXTURES AND EQUIPMENT

A. Branch piping shall be extended and connected to all fixtures and equipment requiring same. Sizes of such connections shall be as indicated on the drawings and the Fixture Schedule, or as required by the particular piece of equipment or fixture being served. If the sizes of such connections are not clearly indicated, the Contractor shall verify the sizes required with the Architect prior to commencement of any roughing-in work. Changes to piping necessitated due to the Contractors' failure to properly verify the required sizes shall be made at the Contractors' expense.

3.8 TESTING

A. Treated Water piping system included under this Contract shall be pressure tested with product water in accordance with manufacturer’s installation instructions. Do not use compressed air, gas or other compressed gases for testing. Do not test piping beyond piping working pressure.

END OF SECTION 221116

SECTION 221316 – SANITARY WASTE AND VENT PIPING

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 SCOPE

A. The sanitary waste and vent piping systems shall be as hereinafter described in this section. Make all required connections into the interior sanitary drainage systems.

1.3 CODE COMPLIANCE

A. All sanitary materials and installation methods shall be subject to the acceptability of that material with the prevailing local plumbing codes.

1.4 PIPE AND MATERIALS

A. This Contractor shall furnish and install sanitary sewer and vent piping as indicated on the Drawings. Pipe sizes indicated are minimum sizes. Minimum size below bottom floor or below ground, interior, 4". Pipe sizes shall be larger where required by local codes.

B. Cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

PART 2 – PRODUCTS

2.1 SANITARY SEWER AND VENT PIPING UNDERGROUND

A. Polyvinyl Chloride (PVC) Plastic Pipe Schedule 40 DWV ASTM 2665 solvent weld. PVC foam core piping and fittings not permitted. PVC pipe and fittings as manufactured by Charlotte, Geneva, Spears, or approved equivalent.

1. SDR-35 PVC piping and fittings will be acceptable for larger interior piping underground where solvent welded Schedule 40 PVC piping and fittings cannot be obtained in those sizes.

B. Provide sanitary sewers exiting the building each with vents, house traps, and cleanouts within the limits of sewer construction included under this Contract work, as required by the prevailing plumbing code and /or the sewer authority having jurisdiction.

1. For sanitary mains that exit the building below structural components, piping shall be sleeved and encased in concrete a minimum of 2’-0” beyond of the structural component, on either side. Coordinate specific requirements with structural design prior to installation.

2. For sanitary mains that exit the building through structural components, piping shall be sleeved through the component. Installation, location, and depth of sleeves need to be strictly coordinated with General Contractor prior to installation.

2.2 SANITARY SOIL, WASTE, AND VENT PIPING ABOVE GROUND.

A. Polyvinyl Chloride (PVC) Schedule 40 Plastic Pipe (DWV) ASTM 2665 solvent weld. PVC foam core piping and fittings not permitted. PVC pipe and fittings as manufactured by Charlotte, Geneva, Spears, or approved equivalent.

B. Automatic air vent or relief valve discharge piping shall be Type "L" copper with drainage pattern fittings. Plastic piping and fittings will not be permitted for this installation.

C. Vent piping to atmosphere shall be minimum 3” diameter and terminate a minimum of 12” above roof level. Terminate vent piping at a higher height above roof level where required by local codes. Rigidly support all vent piping extending through roof.

D. For above ground drainage piping changes in direction, use long sweep fittings where possible; otherwise, short-sweep 1/4 bends, or combination Y and 1/8 bends, also Y's or in combination with other bends; use 45 degree Y or 90 degree Y short turn type for horizontal branches discharging to stacks; however, approval must be obtained for these locations.

F. Where new vent piping is internally connected to existing vent piping which extends through roof, verify height of that existing vent pipe above roof and modify same as necessary to conform with local code and local Plumbing Inspector requirements for correct vent pipe height above roof.

2.3 JOINTS AND CONNECTIONS

A. Joints in PVC pipe shall be accomplished with socket type fittings and solvent-cement welding for the interior DWV System, above floor or below bottom floor.

B. All transition joints in sewers between dissimilar materials or unequal sizes shall be made water and gas tight by means of an approved connection or adapter of the compression or mechanical seal type. The connector or adapter shall be manufactured of preformed Elastomeric Polyvinyl Chloride conforming to ASTM Standards C-425, C-594, C-564, and D-1869. Couplings of the mechanical seal type shall have tightening clamps or devices made of 305 stainless steel. The compression joint connector or adapter and flexible coupling shall be installed as recommended and specified by the manufacturer and each connector shall bear the manufacturer's name clearly visible when installed, such as manufactured by Fernco Joint Sealer Company, Indiana Seal, or Mission.

C. All joints shall be made permanently gas and water tight.

D. The use of any of the above joints and connections shall be subject to their acceptability with the prevailing local plumbing codes.

2.4 FLOOR DRAINS

A. The Contractor shall furnish and install the following types of floor drains, by Zurn, Josam, Smith, Mifab, Wade, or Watts. Refer to “Tamperproof Screws”, Section 220500. All drains shall have 1/2” trap primer connections as shown on the drawings. Plug any unused primer connections.

1. FD-1 – Zurn ZN415-BZ-P-VP Series, bottom outlet, coated cast iron body with polished nickel-bronze leveling strainer, ZN400BZ-VP, Type BZ, vandal-proof, or approved equivalent. Strainers in shower rooms and locker rooms shall be 8" size. All other strainers shall be 6" size. (Finished Areas)

2.5 CLEANOUTS

A. The Contractor shall furnish and install cleanouts at each change in direction greater than 45° in sanitary drainage systems, at the base of all sanitary drainage stacks, and at all other points indicated on the Drawings.

B. Cleanouts installed on under-floor piping, exterior piping, or piping below slab on grade floors shall be extended to floor level or grade level with 45 degree fittings.

C. Cleanouts on concealed piping shall be extended so as to be easily accessible from finish floor, ceiling, or wall.

D. Cleanouts shall be full pipe size up to and including 4", and shall be 4" on larger size piping, if approved by the local authorities having jurisdiction over the installations.

E. All cleanout equipment shall be Zurn, Josam, Smith, Mifab, Wade, or Watts. Refer to "Tamperproof Screws", Section 220500

1. Zurn ZN1443-VP / ZN1447-VP – Cleanout with nickel-bronze access cover with vandal-proof screws, for all piping concealed. For all locations other than where access panels or doors are noted. Plastic, PVC, or fiberglass type cleanout covers not acceptable.

2. Zurn ZN1400-VP – Adjustable floor cleanout with round top, vandal-proof screws. Zurn ZN1400-X-VP – for vinyl tile; ZN1400-Z-VP – for 1-1/4" terrazzo, vandal-proof screws; ZN1400-CM-VP – for carpet installation, vandal-proof screws.

3. Zurn Z1400-HD-VP – Adjustable exterior extra heavy-duty round cleanout, vandalproof screws, cast bronze plug, set in concrete slab, 24" x 24" x 6" thick. Provide nickel-bronze finish cleanouts at any finish entrances or exits of building. Refer to the drawing details.

F. For cleanouts on PVC piping above floor level, cleanouts shall be PVC threaded plugs in wye fittings. For cleanouts on cast iron piping above floor level as described herein, cleanouts shall be cast bronze threaded plugs in wye fittings.

G. Floor cleanouts in interior heavy duty traffic areas, shops, equipment rooms, janitor's closets, and storage rooms shall be cast bronze flush floor plugs, Zurn ZARB-1470-PW, or approved equivalent. Provide two (2) plug wrenches only, total.

H. Floor cleanouts shall be furnished and installed with flashing flanges and clamping collars. Floor cleanouts on the bottom-most slab shall not require flashing.

I. Where vertical piping is installed in chases in finished rooms, extension pieces, if required, shall be placed in tees so as to bring cleanout plugs to the back of the cover plate set flush in the finished walls.

J. Except where cover plates are provided with a recess for inserts of the same material as the floor finish, all cover plates in floors of finished areas shall be scoriated nickel bronze. Frames for the cover plates shall be compatible with the finished flooring material.

K. Care shall be exercised in installing cleanouts to avoid locating them in surfaces to be carpeted. Provide additional piping as required to locate cleanouts in other more accessible surfaces.

L. The Contractor shall lubricate all plugs before installation and shall loosen all covers and plugs before final inspection as directed by the Architect.

2.6 TRAPS

A. PVC shall be used in accordance with applied piping system.

B. A separate trap shall be provided for each plumbing fixture which does not contain an integral trap. In general, all fixture traps shall be provided with accessible cleanout plugs located on the bottom of the bend.

C. Traps shall be set true with respect to their water seals.

D. Refer to Section 221300 for exterior house traps and related cleanouts and vents.

2.7 TRAP PRIMERS

A. Standard type trap primer shall be the Zurn No. Z1022-XL, Josam, Smith, PPP, Mifab, Wade, or Watts, plain bronze body, automatic, 1/2" in/out, with integral vacuum breaker, non-liming internal operating assembly, with gasketed bronze cover. Provide trap primer piping to all floor drains, regardless if piping shown or not on drawings. Valve the inlets to the trap primers. Refer to the drawing details.

1. Provide trap primer distribution units where more than one floor drain is primed, Zurn DU Series, Precision Plumbing Products, Inc., or Sioux Chief, with supply tubes.

2.8 UNDERFLOOR PIPE SLEEVES

A. Underfloor pipe sleeves for water or air piping, where shown or required, shall be constructed of 4" diameter minimum size Schedule 40 PVC piping and fittings. Split piping and fitting systems will be acceptable.

B. Underfloor pipe sleeves for gas piping shall be constructed of Schedule 40 ASTM A-53 black steel pipe with welded joints; plastic coated, or taped and wrapped to prevent corrosion. Installation must conform to Gas Company requirements. Vent the sleeves to exterior of building per Gas Company requirements.

PART 3 – EXECUTION

3.1 GRADE

A. Elevations and locations of floor drains, funnel drains, floor sinks, and cleanouts shall be adjusted to avoid interference with other utilities and equipment without additional expense.

3.2 FLASHING

A. Provide 48" square sheet lead, copper, or neoprene flashing for floor drains, funnel drains, floor sinks, and cleanouts, set integral with floor slab. Chloroloy, or approved equivalent non-plasticized chlorinated polyethylene waterproofing membrane will be acceptable for flashing of floor drains, funnel drains, floor sinks, and cleanouts.

B. Vents through new roof construction will be flashed by the General Contractor. Openings, patching, restoring, and flashing in existing roof by Roofing Contractor at Plumbing Contractor's expense.

3.3 INSTALLATION AND TESTING PROCEDURES

A. Horizontal cast iron pipe and fitting installations above ground, 6" and larger, shall be suitably braced to prevent horizontal movements, at every branch opening or change of direction, by the use of braces, blocks, rodding, or other suitable method, in accordance with pipe manufacturer's and Cast Iron Soil Pipe Institute's installation instructions. Vertical cast iron pipe and fitting installations above ground of all sizes shall be secured at each stack base and

at sufficiently close intervals to keep the system in alignment and to adequately support the weight of the pipe and its contents.

B. Unless noted otherwise on the Drawings or herein specified, or required to suit final floor elevations, all sanitary piping 3” and larger shall be installed with a uniform minimum slope of 1/8" to the foot and all sanitary piping 2” and smaller shall be installed with a uniform minimum slope of 1/4" to the foot, or as otherwise required by local codes.

1. Maintain 30” minimum ground cover over top of exterior sewers.

C. Interior sanitary drainage piping shall be hydrostatically tested after completion of the roughing-in. Piping being tested shall be filled to the top of vent pipes, and left standing for a period of one (1) hour with no loss of water. Smoke tests will be acceptable if required by local authorities. Confirm requirements prior to bidding.

D. After testing and before final acceptance, the Contractor shall completely flush the entire sewer systems and appurtenances included under this Contract in sufficient volume to remove all settlement and debris to obtain free flow through each pipe. Flushing shall be accomplished by the use of automatic flush tanks, fire hoses, or other means approved by the Architect. Depths of water and velocities shall be as required to produce a hydraulic bore. Remove all obstructions and correct all defects discovered.

E. Exercise extreme care to prevent debris from entering floor drains or cleanouts. Carefully check invert elevations of floor drains to which connections are to be made.

F. Inform the Owner’s maintenance personnel of the proper methods of cleaning out all interceptor types.

G. For decontamination tank, inform the Owner’s maintenance personnel of the frequency necessitated to keep the unit cleaned, and the proper methods of cleaning the unit.

3.4 THERMAL EXPANSION AND CONTRACTION – PVC PIPE

A. Highly important is the change of PVC pipe with temperature variations. This fact shall always be considered when installing PVC pipe piping, and allowances made accordingly.

B. Compensate for PVC piping thermal expansion and contraction in accordance with PVC manufacturer’s instructions and local code requirements. Utilize the following, but not limited to: offsets, loops, additional bends, piston type expansion joints with “O” ring design, and axial guides. Expansion joints must be accessible.

3.5 FINAL INSPECTION

A. At the time of final inspection of the work performed under the Contract, the floor drains and cleanouts shall be complete in every respect and in perfect operating condition. All surplus materials of every description resulting from the work shall have been removed. Floor drains shall be free from debris, sand, silt or other obstructions. Any defects discovered in the floor drains, floor sinks, funnel drains, and cleanouts subsequent to this inspection shall have been corrected.

B. Inform Owner’s Operating Personnel to properly maintain trap seals, and periodically flush trap seals with fresh water to clear any foreign objects.

END OF SECTION 221316

SECTION 221420 – WET PIPE FIRE SUPPRESSION SPRINKLER SYSTEMS

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.

B. The General and Special Conditions and Section, "Basic Plumbing Materials and Methods" (Section 220500, "Common Work Results for Plumbing") are included as a part of this section as though written in full in this specification. All fire protection system work shall be completed by a licensed, certified, Fire Protection Contractor acting as a subcontractor to the Plumbing Contractor. All work shall be directly coordinated with the local Fire Department.

C. The Plumbing Contractor shall furnish and install a flanged connection at interior water service entrance for beginning the Fire Protection Subcontractor's work. Final connections to flange will be completed by the Fire Protection Subcontractor.

D. All pipe materials shall be subject to the acceptability of that material with the prevailing local fire and plumbing codes, NFPA 13.

E. The Drawings and Specifications for this project are generally schematic and are intended for bidding purposes only **and are not intended to cover each item required for a total system as outlined in NFPA 13.** The minimum spacing, quantity and arrangement of proposed sprinkler locations, equipment, piping, and standpipes indicated on the Drawings generally are diagrammatic. The exact arrangement, sizes, quantity and spacing required by the agencies having jurisdiction shall be indicated on the Working Drawings that are to be prepared by the Contractor.

1.3 SCOPE

A. The fire protection work to be performed shall include the following, but not necessarily limited to:

1. Furnish and install Contractor-hydraulically designed wet fire protection systems, including all required drain piping and accessories, complete in every detail.

2. Directly after award of Contract, regardless of dates of existing flow tests; or flow test data obtained or shown on any drawings; and prior to any submittal, the Contractor shall be responsible for conducting and obtaining new flow test data. Obtain water flow, pressure, capacity data, elevations, and other related pertinent information from the nearest available fire hydrant(s), and as arranged with the Water Authority serving the building. Arrange any times and dates with the Water Authority. Water flow test data obtained from the Water Authority will not be acceptable, regardless of when such flow tests were performed. Include all costs involved with obtaining the flow test data, including the use of special tools, equipment, and accessories and include in the Contract Bid. Typed copies of confirmed flow test results shall be furnished by the Contractor to the Professional and the Architect. Approval by the Architect of Contractor's test results is necessary prior to forwarding submittals or beginning any work.

3. Include all tests, permits, and fees, including all costs involved.

4. Contractor shall complete all Contractor's Material and Test Certificates for above ground and below ground installations.

1.4 CODE COMPLIANCE

A. All fire protection work and materials herein described shall comply with all applicable federal, state, county, health, and local laws, ordinances, rules and regulations, and all other local authorities having jurisdiction and shall be subject to the approval of these authorities, notwithstanding anything in these specifications to the contrary. In addition, all work and materials to be provided under this Section of the Specification shall conform to the applicable requirements of the National Board of Fire Underwriters Standards, and the National Fire Protection Association Standards; special reference is made to NFPA 13.

1.5 SHOP DRAWINGS

A. Product Data: Submit manufacturer's technical product data and installation instructions for all fire protection materials and products.

B. Approval Drawings: All fees for this approval shall be by this Contractor. Prepare approval drawings of the fire protection systems coordinated with other mechanical, electrical, structural and general building drawings, of the fire protection systems proposed by the Plumbing Contractor and submit prints of the drawings to the appropriate governmental, health, and underwriting agencies for their review and approval. Prints bearing the approval stamp of the Underwriting Agency, authorized Fire Marshal and other Authorities having jurisdiction shall be submitted to the Architect prior to the commencement of any fabrication or installation of any portion of the system. The drawings shall include all of the following information and whatever additional information that may be required by the authority having jurisdiction.

1. All sets of drawings with appropriate NFPA standards listed.

2. System type.

3. Total number of risers.

4. Sprinkler spacing and locations with dimensions showing all lighting fixtures, diffusers and return air grilles.

5. Occupancy type.

6. Hazard classification.

7. Hangers, types and details.

8. Temperature and type of sprinkler heads.

9. Water flow indicators and monitor (tamper) switches.

10. Alarm check valve.

11. Electric alarm bell.

12. Siamese fire department connections.

13. Sprinkler system accessories and specialties.

14. Double check valve assemblies.

15. Automatic air maintenance device.

16. Dry valve and accessories.

17. Dry sprinkler heads.

C. Approval Calculations: Prepare hydraulic calculations of fire protection systems to determine all pipe sizes. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction to the Architect before proceeding with the installation.

D. Certificate of Installation: Submit certificates upon completion of fire protection work which indicates that work has been installed and tested in accordance with NFPA 13 and NFPA 14, and also that the system is operational, complete and has no defects.

E. Record Drawings: At project closeout, submit record as-built drawings of installed fire protection piping and products.

F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculations, certificate of installation and record drawings in maintenance manual.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION PIPING AND EQUIPMENT INSIDE BUILDING

A. Pipe:

1. All wet system piping herein specified shall be UL Listed and FM Approved. Pipe shall be as manufactured by Allied Tube & Conduit, Youngstown Tube Co., or Wheatland Tube Company. For the wet-pipe systems only, all piping that utilizes threaded fittings shall be Schedule 40 black steel. “Plain-end” pipe/fittings and threadable light-wall pipe are not permitted. Sprinkler piping 1-1/4” in diameter or larger, connected by welded, flanged fittings or roll grooved fittings, shall be Schedule 40 or Schedule 10 as permitted by NFPA 13. Cut grooves are not permitted. All sprinkler piping 2” in diameter and smaller (that is not roll grooved or welded) shall be Schedule 40 utilizing screwed fittings (plain end fittings will not be accepted). All miscellaneous drain and test piping and fittings shall be Schedule 40, internally and externally galvanized. All piping shall include factory coating of the inner wall of piping, to guard against MIC (microbiologically influenced corrosion). The coating shall adhere to the wall of the pipe, thereby providing protection against contamination and pipe deterioration by impeding the attachment of microbes to the pipe wall.

2. Contractor shall use a flexible stainless-steel hose to connect sprinkler heads to the branch lines. System shall be UL Listed and FM Approved type, conforming to NFPA 13, as manufactured by FlexHead Industries, Inc., Fivalco, Inc., AquaFlex, or Gateway Tubing, Inc. Flexible hose shall be rated up to 300 psi, in 2-6 foot lengths. Each system shall be factory pressure and leak-tested. Approval on models of flexible metal sprinkler hose is limited for use in commercial suspended or sheetrock ceilings, with ceiling bracket assembly, without hangers. System shall be approved for use in suspended ceilings with light, medium, and heavy load grids (ASTM C635, C636). System will not be acceptable for exposed sprinkler system installations. System shall be installed in strict accordance with manufacturer’s installation instructions. System installation must be acceptable to the Owner and Fire Insurance Carrier.

B. Hangers for the fire protection system shall be UL Listed, FM approved. Contractor's attention is directed to "Unsupported Armover Lengths", for pipe hanger installations for pressures above and below 100 psi, in accordance with NFPA 13

C. Fittings:

1. For wet-pipe system, 150 psi, screwed malleable iron, or Victaulic FireLock ductile iron fittings and FireLock EZ ductile iron, Nibco Steelok, or Tyco couplings for grooved end piping. Grooved end fittings and couplings shall be UL Listed and FM approved and shall be the products of a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components.

2. Grooved mechanical rigid type couplings consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. 1-1/4" through 4" sizes shall be Victaulic Firelock EZ Style 009H "Installation Ready", or approved equivalent, stab-on coupling for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. 5" and larger shall be Victaulic FireLock Style 005 or Style 07 Zero-Flex, or approved equivalent, standard rigid couplings.

3. Flexible type couplings shall be used in seismic areas where required by NFPA 13. 2" through 8" sizes shall be Victaulic Style 177 QuickVic, or approved equivalent, coupling designed for direct installation onto grooved end pipe without prior field disassembly.

4. Coupling gaskets shall be pressure responsive, synthetic rubber, Grade "E" EPDM Type A, pre-lubricated for wet pipe systems.

5. Flange adapters shall be ductile iron, flat faced, designed for incorporating flanged components with ANSI Class 125 and 150 bolt-hole patterns to a grooved piping system. Victaulic Style 741 or 744 or approved equivalent.

D. Valves shall be as manufactured by Nibco, Victaulic, or Tyco.

1. For sizes 2" and smaller, valves shall be bronze ball type, 175 pound WWP minimum, UL, FM, threaded or grooved body style, the Victaulic FireLock Series 728, or approved equivalent. The Nibco No. T-104-0, threaded, UL, FM valve, bronze gate, 175 pound WWP minimum, will be acceptable, or approved equivalent. For sizes 2-1/2" and larger, valves shall have iron body, 200 pound WWP minimum, UL, FM, with resilient wedge, flanged ends, the Nibco F-607-RW, grooved ends, Victaulic Series 771, or approved equivalent.

2. Butterfly valves will be acceptable, UL, FM. Milwaukee "Butterball" butterfly valves, or approved equivalent, UL, FM, will be acceptable. Grooved end butterfly valves UL, FM, with weather-proof actuator and pre-wired supervisory switches monitoring the valve in the open position shall be Victaulic FireLock Series 705 (300 psi) or Series 765 (365 psi) maximum CWP, or approved equivalent.

3. Check valves 2" and smaller shall be bronze, 200 pound WWP minimum, threaded, renewable rubber disc, and shall be the Nibco No. KT-403-W, or approved equivalent. Check valves 2-1/2" and larger shall have iron body, renewable seat and rubber disc, 175 pound WWP minimum, flanged, UL, FM, and shall be the Nibco No. F-908-W, or approved equivalent. Grooved end check valves shall have ductile iron body, stainless steel or EPDM coated ductile iron disc, UL, FM, and shall be Victaulic Series 717 (250 psi) or Series 717H (365 psi), or approved equivalent.

4. Inspector's test and drain valves shall be 175 pound WWP minimum, bronze screwed, angle, or straight globe valves, UL Listed, rubber disc, the Nibco No.'s KT-65 UL, KT-67 UL, KT-211-W-UL, or approved equivalent. The Nibco No. KT-580-70-UL and No. KT-585-70-UL, threaded, bronze ball valves, UL listed, 175 pounds WWP, will be acceptable.

5. The AGF Model 1000 Test and Drain, UL, FM approved, Victaulic Styles 720 TestMaster Alarm Test Module, or Sure-Test shall be utilized for drain systems.

6. Alarm Check Valve: Black enamel coated ductile iron body, aluminum bronze clapper, stainless steel spring and shaft, EPDM seal, and Nitrile seat O-rings; Victaulic FireLock® Series 751 or approved equivalent. Valve internal parts shall be replaceable without removing the valve from the installed position. Water working pressure is 300 psi. Suitable for constant and variable pressure systems; provide optional retard chamber as required with full trim package.

E. Monitor (Tamper) Switches: Provide monitor switches on all shut-off valves. Monitor switches shall be as manufactured by System Sensor Model OSY2 and PIBV2, Viking Model OSYSU, PCVS, or Potter-Roemer, Inc. Electrical contacts shall be such as to perform the functions required or described under the “Fire Alarm” section of the Electrical Construction Specifications. Switches will be wired and connected to the Fire Alarm System by the Electrical Contractor.

F. Flow Indicators: Water flow indicators must be located a minimum of 18 inches from any elbow or tee to minimize flow turbulence. The flow switches shall be as manufactured by Viking, Model VSR, System Sensor or Potter-Roemer, Inc. The flow switch shall have contacts such as to perform the functions required or described under the “Fire Alarm” Section of the Electrical Construction Specifications. Flow indicators will be wired and connected to the Fire Alarm System by the Electrical Contractor.

G. Sprinkler Heads: All sprinkler heads shall be the product of a single manufacturer, UL Listed, and FM approved. All heads shall be the same model year and style throughout. The Architect must approve any deviations. Sprinkler heads shall be of a type, upright, pendent, or sidewall that is best suited to the conditions in which they are installed. Heads shall be as manufactured by Viking, Tyco, or Victaulic. Provide quick response sprinkler heads where required, in accordance with NFPA requirements. Heads which must be painted, shall be factory-painted only. Where required, heads shall be of a design suited to the protection of areas having irregular building design and structural arrangements such as cornices, soffits, beams and columns or building environmental systems such as light fixtures, grilles and diffusers, or building furnishings and equipment. Full consideration shall be given in the spacing of heads, of the type of head, and the arrangement of the piping to afford the protection required to be installed. Temperature ratings of all heads shall be coordinated with the NFPA 13 requirements. The Victaulic “strapless” style sprinkler heads will not be acceptable. The finish and type of sprinkler heads in finished areas must be approved by the Architect.

1. In general, sprinkler heads in finished areas with ceilings shall be fully recessed, concealed type. Heads shall include finished flat coverplate installed flush with ceiling, the Viking Mirage (QR, 5.6K, VK462), Victaulic Model V38, or approved equivalent. Finish and color of flat coverplate shall be as selected by the Architect.

2. Sprinkler heads in service rooms with ceilings shall be semi-recessed type, chrome finish, the Viking Model M (QR, 5.6K, VK302), Victaulic Model V27, or approved equivalent.

3. Where indicated on the drawings, sprinkler heads shall be semi-recessed, extended coverage, chrome finish, the Viking Microfast (QR, 5.6K, VK600), or approved equivalent.

4. Sprinkler heads in unfinished areas installed on exposed piping shall generally be of the upright type having rough bronze finish, the Viking Model M (QR, 5.6 K, VK300), Victaulic Model V27, or approved equivalent.

5. Use chromed heads on exposed piping or concealed piping in finished areas.

6. Sidewall heads having a bronze finish or chrome finish shall be the Viking Model M (QR, 5.6K, VK305), Victaulic Model V27, or approved equivalent.

7. Concealed horizontal sidewall sprinkler heads shall be quick response, extended coverage, UL Listed, and shall be the Viking VK630, with 14' x 26' coverage, Reliable, or Tyco.

8. In areas subject to corrosive atmosphere, heads shall be lead coated, Nickel-Teflon coated, or wax coated as required.

9. Guards shall be provided on all heads subject to mechanical damage where normal movement of equipment or products would present a hazard to the sprinkler head, Viking Model D-1 Guard, or approved equivalent, such as Gymnasium, Multi-Purpose Room, equipment rooms, storage rooms, and similar areas. All sprinkler heads in areas throughout the building that are below 7 foot clearance shall be equipped with head guards. Sprinkler head guards shall be listed, supplied, and approved for use with the sprinkler, by the sprinkler manufacturer.

10. Sprinklers installed under open gratings shall be of the intermediate level/rack storage type or otherwise shielded from the discharge of overhead sprinklers, Victaulic Model LP-46, or approved equivalent.

11. Coordinate installation of sprinkler heads with surface mounted lighting fixtures for proper clearances.

12. Install sprinklers under all ducts or obstructions greater than 48" in width in accordance with NFPA 13.

13. Provide appropriate sprinkler heads with proper discharges for any water curtains, meeting requirements of NFPA 13.

14. Sprinklers in skylight wells shall conform to NFPA requirements, and including appropriate sprinkler head temperature ratings.

15. Horizontal sidewall and pendent vertical sprinkler heads for glass window applications shall be the Victaulic Model V10, Tyco WS Series, or Viking.

16. Sprinkler Head Cabinet: Provide six (6) extra and head wrench.

H. In accordance with UL listing requirements, protective caps or straps shall be required for all glass bulb sprinklers. The caps or straps shall be removed from the sprinklers only when the system is "placed in service", in accordance with NFPA definitions. Protective caps and straps shall be removed only using means in accordance with manufacturer's installation instructions. "Dropped" glass sprinklers, with or without protection, shall be replaced. Solder element sprinklers are not required to be protected with caps or straps.

I. Siamese Inlet Connections: Potter Roemer, Inc., 5000-D Series, 4" x 2-1/2" x 2-1/2", Reliable, or Elkhart, flush wall mounted, double inlet with caps and chains and ball drip device. All polished chrome plated and marked "Auto Sprinkler Standpipe". Coordinate finish of Siamese

inlet connections with the Architect prior to ordering the equipment. Extend ball drip piping in accordance with applicable local code requirements. Coordinate type lettering, threads, and mounting with the Fire Department before ordering the equipment. Provide Storz inlet connections of required sizes and type with appropriate lettering where required by the Fire Department.

J. Double Check Valve (Vertical Flow Up Installation): Watts No. 774- OSY (2-1/2" Thru 12") or No. 774XDCDA-OSY (6" or 8"), with main body, 300 Series stainless steel; all internal metal parts, 300 Series stainless steel; UL, FM, with O.S. & Y. gate valves, Ames, or Wilkins. Provide meter reading in CFM or GPM and any remote meter reading per local Water Authority requirements.

K. Electric Alarm Bell: Potter-Roemer, Inc., Model PBA2410, Victaulic, or Viking, 10" minimum diameter, enameled steel or aluminum bell with 24 volt AC electric motor. Wiring from fire alarm panel to the alarm bell will be completed by the Electrical Contractor. Finish and color shall match building construction per requirements of the Architect; coordinate before ordering. Paint other than "red" when required by the Architect; but approved by the Fire Department.

L. Water-Operated Alarm Gong: Reliable Model C, Victaulic, or Viking, mechanical, 10" minimum diameter, aluminum or enameled steel gong, self setting. UL Listed, FM approved, requiring no lubrication. Finish and color shall match building construction per requirements of the Architect, coordinate before ordering. Paint other than "red" when required by the Architect; but approved by the Fire Department.

M. Flushing: Completely flush out piping systems included under this Contract.

N. Splashblocks: Where shown or required, terminate fire protection system test and drain lines over splashblocks at the exterior of the building. Refer to Section 220520 for specifications.

O. Escutcheons: All pipe escutcheons shall be chrome, cast brass, set screw type, refer to Section 220500 for particulars.

P. Pressure Gauges: Potter-Roemer Inc. Model 6240, Patterson, or Viking, 0-300 psi, 3-1/2" minimum diameter, with T-handle gauge cock. Provide pressure gauges at fire main service entrance, at top of each main riser, and at any other locations shown.

Q. Signs: Furnish and place operation signs and other signs where required, Potter-Roemer, Inc., Reliable, or Viking.

R. Expansion Joints: Separate expansion joints required shall be a braided stainless steel flexible pipe connector, as manufactured by Flex-Hose Co., Inc., Flexonics, or Flexible Metal, Inc., suitable for fire service. Expansion joints must be accessible.

S. Fire Extinguishers: Furnish and install portable wall mounted ABC multi-purpose dry chemical fire extinguishers where shown, or at locations directed by the Architect. Fire extinguisher shall provide protection against Class A, B, and C fires. Extinguisher shall be installed in accordance with NFPA Pamphlet No. 10. Fire extinguisher shall be the Potter Roemer 3000 Series, Model 3020, Elkhart, or approved equivalent, 20 lbs., with 20A: 120B: C UL Listed minimum rating, with FM approval, range of stream, 15'- to 21', with hose discharge. Extinguisher shall be red glossy polyester – coated steel cylinder, with pressure gauge and wall mounting bracket.

T. Smoke Detectors: Provide and wire addressable photoelectric or ionization open area smoke detectors as follows:

1. Provide analog smoke detectors utilizing the photoelectric light scattering principle or ionization principal for operation. Smoke detectors shall be listed for use with the fire alarm control panel and the releasing panel.

2. Provide self-restoring type detectors which do not require any readjustment after actuation to restore it to normal operation. Detectors shall be UL listed as Smoke – Automatic Fire Detectors. Install detectors in accordance with the requirements described in the listing.

3. Detectors shall have alarm verification capability and an environmental compensation feature and provided with an insect screen.

4. Provide twist lock bases for the detectors. The detectors shall maintain contact with their bases without the use of springs. Provide companion mounting base with fixed wiring terminals. The detector shall have a visual indictor to show actuation.

5. The detector address shall identify the particular unit, its location within the system, and its sensitivity setting. Detector shall be of the low voltage type rated for use on a 24 VDC system.

6. Detectors shall be equipped with screw terminals for each conductor.

7. Smoke detectors shall be Simplex Type 4098-9714 with base 4098-9792, or approved equivalent.

PART 3 - EXECUTION

3.1 SPRINKLER SYSTEM INSTALLATIONS

A. All systems shall be fully automatic, shall be complete in all detail, and shall be provided with all the required components and devices necessary to install approved systems.

B. The layout of the sprinkler system, the arrangements of the heads; and the location and size of main and branch piping shall be developed from the design requirements of the applicable sprinkler criteria and the limitations imposed by the structural and architectural design. However, the degree of protection, hence the exact spacing and arrangement of the sprinkler heads and pipe sizes in any area shall be as required by the authority having jurisdiction.

C. Rearrangement of branch piping and adjustment of the pipe sizes, where proven by hydraulic calculations and when approved by the authorities having jurisdiction, and where compatible with the building design, may be made in the preparation of the Shop Drawings.

D. In finished areas, sprinkler heads shall be uniformly spaced and patterned to suit the ceiling finishes, decorations and interferences. In unfinished areas, the pattern of spacing and the coverage shall be as determined by the shape of the space and the interferences caused by construction details and the furnishings of the space. Maximum spacing shall not exceed that permitted by the authority having jurisdiction. Sprinkler heads in “lay-in” ceilings shall be centered in both directions.

E. Additional spare sprinkler heads of each type shall be provided to the Owner. Not less than six (6) heads or 2% of the total number of each type of head shall be furnished to the Owner for storage. Furnish and install a metal wall storage cabinet, mounted where directed by the Architect. Storage cabinet shall be as manufactured by Tyco, Victaulic, or Viking. A wrench suited to each type of head shall also be provided in the cabinet.

F. Test pipes with control valves shall be provided as required in the fire protection system.

G. All flow switches, monitor switches, and similar equipment must be accessible to local fire officials, regardless of location, exposed or concealed.

H. Upon installation, the double check valve shall be tested under the Fire Protection Subcontract, in accordance with manufacturer's installation standards, or in accordance with local authorities or utility company having jurisdiction over the installation. All testing shall be completed by persons certified in this type of work. All costs, fees, or charges required for testing shall be included in the Contract price.

I. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

3.2 FIRE PROTECTION SYSTEM TESTS

A. Before the completed fire protection system is accepted by the Owner, the entire system included under this Contract shall be pressure tested by the Contractor and approved in the presence of representatives of the Owner, the Architect, local Fire Department, local authorities, the Insurance Underwriters, and any other parties directly concerned.

B. This Contractor shall furnish all labor and equipment and shall conduct and bear the cost of all required tests of the fire protection system. This Contractor shall give all concerned parties three days advance notice of scheduled tests; 48 hours to Water Authority

C. The entire fire protection system included under this Contract shall be tested under a hydrostatic pressure of not less than 200 lbs. for at least two hours, or at 50 psi in excess of the maximum static pressure when the maximum static pressure is in excess of 150 psi, or as otherwise required or directed by the local Fire Department. Testing of underground service main piping shall conform to NFPA 24 requirements. All defective work shall be promptly repaired or replaced with new pipe and fittings, etc.

D. Tests shall be repeated until the installation receives the approval of the Architect and all parties concerned.

E. Any damage resulting from the tests shall be repaired and/or damaged materials replaced, all to the satisfaction of the Architect, at the expense of this Contractor.

END OF SECTION 221420

G. All flow switches, monitor switches, and similar equipment must be accessible to local fire officials, regardless of location, exposed or concealed.

H. Upon installation, the double check valve shall be tested under the Fire Protection Subcontract, in accordance with manufacturer's installation standards, or in accordance with local authorities or utility company having jurisdiction over the installation. All testing shall be completed by persons certified in this type of work. All costs, fees, or charges required for testing shall be included in the Contract price.

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D. Tests shall be repeated until the installation receives the approval of the Architect and all parties concerned.

E. Any damage resulting from the tests shall be repaired and/or damaged materials replaced, all to the satisfaction of the Architect, at the expense of this Contractor.

END OF SECTION 221420

SECTION 221429 – PLUMBING PUMPS

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 SCOPE

A. The pumps shall each be as described in this section, of sizes and capacities as noted on the Drawings.

B. The pumps shall each be installed in accordance with the prevailing local plumbing codes.

C. All pumps must be accessible.

D. Refer to “Electric Motors”, Section 220500.

PART 2 - PRODUCTS

2.1 DOMESTIC HOT WATER RECIRCULATING PUMPS (HWCP)

A. HWCP-1 – Hot Water circulating pumps shall each be of all bronze construction or stainless steel construction, lubricated, the Bell and Gossett Booster Series, Taco, or Grundfos. Provide an aquastat to control each pump operation. Refer to the schedule shown on drawings for capacities.

1. Circulating pump providing circulation between heater and storage tank shall be the B & G Series, Taco, or Armstrong, furnished by the heater manufacturer for installation under the Plumbing Contract.

B. Power wiring will be furnished and installed under the Electrical Contract. Manual motor starters shall be furnished under the Plumbing Contract and delivered to the Electrical Contractor for installation. All control wiring required to operate aquastats and pumps shall be included under this Contract, of type specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install each pump in accordance with manufacturer's written recommendations and installation instructions.

B. For each recirculating pump, furnish and install a ball shutoff valve and strainer on inlet piping to the pump, with a balancing cock on outlet piping. Furnish and install a check valve where shown.

C. Place each pump in service and check power draw, voltage, and proper system operation. Report the actual current draw and pump flow, and other information for each pump. Provide written results to the Owner.

END OF SECTION 221429

SECTION 223300 – DOMESTIC WATER HEATING EQUIPMENT

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 STIPULATIONS

A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.3 SCOPE

A. Furnish and install **electric** domestic water heater, complete with expansion tank, equipment and associated accessories, as shown on the Drawings.

1.4 CODE COMPLIANCE

A. Water heater shall be installed in accordance with and shall meet or exceed the energy efficiency requirements set forth by applicable portions of The International Energy Conservation Code, and all applicable state, federal, and local codes having jurisdiction.

PART 2 - PRODUCTS

2.1 DWH-1 – ELECTRIC HOT WATER HEATERS

A. Each heater shall be AO Smith, Rheem, State, or Bradford White. Heater shall be glass-lined, listed by Underwriters' Laboratories and approved by the National Sanitation Foundation. All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1600 degrees F. Electric heating elements shall be medium watt density screw-in type. Tank shall be cathodically protected with adequate extruded magnesium rod. The entire vessel shall be enclosed in a round steel enclosure with baked enamel finish. Control compartment shall be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactors, immersion style operating thermostats, high limit thermostats, element fusing per N.E.C., and commercial guide incoloy sheathed flange mounted elements with prewired terminal leads. Temperature controls, include limiting switch which will require resetting manually in the event the temperature reaches 190 degrees F. The heater tank shall have a three year limited warranty. Heater with foam insulation (R-16) shall meet or exceed latest requirements of ASHRAE 90.1b-1992 for heat loss efficiency. Fiberglass insulation acceptable. Unit shall include brass drain valve, ASME temperature and pressure relief valve, and 4" x 6" handhole cleanout. Refer to the drawing details. Furnish Owner with sufficient fully illustrated instruction manuals and parts lists for the heater. Refer to the schedule shown on drawings for capacities.

B. Furnish and install an expansion tank for each heater, of suitable capacity for the heater, of type specified.

C. Provide a Modulating Controller for all water heaters that require multiple immersion heaters. Controller shall be provided by Water Heating Manufacturer, and the controller shall stage the immersion heaters as needed.

D. All power wiring for electric heaters will be included under the Electrical Contract; all control wiring by Plumbing Contractor.

2.2 EXPANSION TANKS

A. Furnish and install an ASME expansion tank for the hot water system, potable type, similar to the Watts DETA Series, Wessels Company, or Amtrol, of required capacity. Tank shall be precharged, field adjustable, carbon steel, with FDA approved bladder, stainless steel system connection, and charging valve. Tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code, with prime painted exterior. Insulate expansion tank as specified. (Heater shall also be furnished with an expansion tank as shown and hereinbefore specified and shall also be insulated as specified.) Expansion tanks shall each be furnished with an ASME pressure relief valve as designated by the MD Department of Labor and Industry regulations. Valve inlets to each tank.

2.3 RELIEF VALVES

A. Refer to Section 220523, “Domestic Water Valves”.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install thermometers and pressure gauges at locations shown or specified for the water heating piping and equipment, of types specified. Refer to Section 221119.

END OF SECTION 223300

SECTION 224000 – PLUMBING FIXTURES

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 SCOPE

A. The plumbing fixtures, trim, accessories, and miscellaneous equipment shall be as shown on the drawings. Additional manufacturer's names of fixtures, trim, and miscellaneous equipment shall be listed herein.

B. All plumbing fixtures and trim shall be new and of the best quality. All fixtures shall bear the manufacturers' guarantee label or trademark, indicating first quality.

C. **ALL** fixtures and associated trim, including traps, stops, faucets, flush valves, etc., shall be 'Lead Free' or 'No Lead' and shall be documented as such as part of the submittal process.

D. All vitreous china, cast iron, and prefabricated fiberglass, polyethylene, acrylic, or polypropylene fixtures shall be white and all fixtures of all types shall be specially selected, free from cracks, chips, flaws, stains and warping, and other defects. Fixtures shall be replaced by the Contractor, and the guarantee period on such replaced fixtures shall be extended for the full term of the guarantee from the date of replacement.

E. The Contractor shall refer to the Drawings for the quantities of plumbing fixtures of each kind to be furnished.

F. Provide adapters on all final piping connections to equipment furnished under other contracts or by the Owner.

G. All fixtures and trim shall be as listed below. Confirm requirements of all fixtures, trim, and manufacturers with Owner prior to ordering. Trim shall be commercial grade.

1. Water Closets, Urinals, – Kohler
2. Mop Basin – Zurn
3. Stainless Steel Sinks –Elkay
4. Electric Water Coolers –Elkay
5. Water Closet / Urinal Flush Valves – Sloan Royal only
6. Kitchen Sink Faucets - Delta
7. Lavatory Faucets – Delta
8. Mop Basin Faucet – Zurn
9. Fixture Support Carriers – Zurn, Josam, Smith, Wade, or Watts
10. Waste/Trap Assemblies – Zurn, McGuire Mfg., or Kohler
11. Water Supplies/Stops – Zurn, McGuire Mfg., or Kohler

12. Insulation Kits – Zurn, McGuire, or Truebro

H. All fixtures and equipment shall be properly trapped in accordance with local code requirements.

I. All exposed piping to fixtures shall be chrome plated. Chrome traps and chrome tubing shall be 17 gauge minimum. All traps of all types, exposed and accessible concealed, shall each include cleanout. Chrome finishes shall not be required for fixtures that require insulation kits.

J. All escutcheons shall be chrome, cast brass, set screw type, including on drain assemblies, water supplies at fixtures, and including piping inside fixture cabinets.

K. Plumbing Contractor shall furnish templates to General Contractor for cut-out work for built-in sinks and lavatories. Confirm available cabinet sizes with the General Contractor or Equipment Supplier prior to ordering counter sinks or counter lavatories of any type.

1. The Plumbing Contractor's particular attention is directed to the fact that on ADA sinks with bubblers, the bubbler must be located not more than 5" back from the front edge of the counter. Coordinate this bubbler location with the General Contractor prior to ordering sinks or constructing counter installations of any type. If necessary, modify bubbler front location sink punching to specially accomplish the proper location of the bubbler, in accordance with ADA requirements.

L. Rigidly secure shower head supply piping so that heads do not move. Use copper eared tube hangers, locking tube nuts, secured shower riser fittings, or shower arm support adapters, as manufactured by Sioux Chief Manufacturing, or approved equivalent.

M. Rigidly secure flush valve supply piping so that valves do not move. Include suitable piping support adapters, as manufactured by Sioux Chief Manufacturing, or approved equivalent. Split ring chrome flush valve supports acceptable.

N. Supply piping to fixtures, faucets, shower heads, wall hydrants, and hose bibbs shall be securely anchored to prevent movement.

O. All ADA water closet flush valve (or tank flushing) handles shall be mounted on wide side of toilet areas.

P. All ADA sinks shall have center rear drain outlets and shall be 5-1/2" deep.

Q. Contractor shall coordinate all installations with Architectural Drawing elevations and ADA required clearances.

R. Wiring with conduit from transformers above ceiling to sensor-operated equipment shall be furnished and installed under the Plumbing Contract; refer to Section 15051 (220500).

S. To inhibit the growth of bacteria, mold, fungi, and other microorganisms, a permanent anti-microbial product protection coating of inorganic silver-ion technology shall be applied to metal fixture trim and accessories and shall be included under the Plumbing Contract as herein specified. The coating shall be "Sani or approved equivalent guard", by CHG (Component Hardware Group), as a basis of design, McGuire, or other same coating manufacturer. Contractor shall arrange to have coating applied to metal fixture trim and accessories furnished under this Contract. Have coating applied to the following (but not limited to) fixture trim and accessories:

1. Flush valves.

2. P-traps.

3. Sink and lavatory drain assemblies.

4. Manual faucets, handles, spouts, escutcheons, and support base assemblies.

5. Stainless steel sinks and lavatory bowls.

6. Stainless steel water coolers.

PART 2 - PRODUCTS

2.1 FIXTURES

A. EWC-1 – Dual Height Electric Water Cooler with Bottle Filling Station – Standard & Disabled Height

1. Fixture shall be Elkay Model LZSTL8WSLP Bi-Level". Unit shall be dual purpose type, one fountain mounted at standard height; the other, for ADA compliance. Chrome plated brass bubblers. The unit shall deliver 8.0 gallons per hour of chilled drinking water. Each water cooler shall have a No. 4 stainless steel cabinet. Include all required piping for both coolers. Complete with hanger brackets, waste bends, strainers, and tailpieces.

2. Fixture shall also include a manufacturer's stainless steel skirt assembly for compliance with ANSI accessibility guidepiping for the blind. Skirt shall comply with ADA. Unit shall be complete with all mounting hardware and shall be installed by the Plumbing Contractor. Oasis Model 035174-014.

3. In-Line Strainer: Elkay, 100 micron mesh screen, or equivalent.

4. Filter – Elkay, Versafilter 12" x 3", Filter media includes chlorine, taste, odor and lead reducing element.

B. FD – Floor Drains

1. Refer to Specification Section 221316 "Sanitary Waste and Vent Piping" for all floor drain types.

C. L-1 – Integral Counter Bowl with ***Metering*** Faucet – Standard Height

1. Drain shall be Zurn No. Z8743-PC flat perforated, with 1-1/4" tailpiece.

2. P-Trap assembly shall be Zurn No. Z8701-9-PC, 1-1/4" x 1-1/2", with cleanout.

3. Water supplies shall be Zurn Z8800-XL-LRLK-PC. Brass ball valve type "convertible" stops acceptable.

4. ***Metering*** Faucet shall be Delta 86T1153, 'Lead Free' center-set with vandal resistant lever handles and Omni or equivalent vandal-resistant 0.5 GPM faucet outlet fitting.

D. L-2 – Integral Counter Bowl with ***Metering*** Faucet – Disabled Height

1. Drain shall be Zurn No. Z8746-PC flat perforated strainer drain with 1-1/4" offset tailpiece.

2. P-Trap assembly shall be Zurn No. Z8701-9-PC, 1-1/4" x 1-1/2", with cleanout.

3. Water supplies shall be Zurn Z8800-XL-LRLK-PC. Brass ball valve type "convertible" stops acceptable. Provide Zurn No. Z8946-3-NT ADA compliant insulation kit for waste and supply assemblies.

4. ***Metering*** Faucet shall be Delta 86T1153, 'Lead Free' center-set with vandal resistant lever handles and Omni or equivalent vandal-resistant 0.5 GPM faucet outlet fitting.

E. MB-1 – Mop Basin

1. Zurn No. Z1996-24-SD-BS-WG-HH-MH mop basin, 24" x 24" x 10" high, with stainless steel dome strainer and 3" outlet, of color selected by Architect. Complete with four (4) stainless steel rim guards; back and side 24" stainless steel wall guard panels, of number required by the installation, Type 304, 20 gauge; 30" heavy duty 5/8" rubber hose/bracket combination and mop hanger bracket, stainless steel, 24" x 3" wide. Use silicone sealant caulk on all wall and floor contact edges.

2. Faucet shall be Zurn No. 1996-SF faucet with vacuum breaker spout, pail hook, wall brace, lever handles, and rough chrome plate finish.

   a. Furnish and install check valves in hot and cold water piping serving the combination faucet.

3. Provide Hose Bibb Zurn Z1341 with vacuum breaker, 36" above mop basin.

F. SS-1 & 2 – Under Counter Mount Single Bowl Stainless Steel Sink with ***Manual*** Faucet – Disabled Height

1. Elkay, ELUHAD141455PD single bowl, Type 304, 18-8, 18 gauge stainless steel countertop ledgeback sink unit, ***16 1/2"X16 1/2"***, 5 3/8" deep. Sound deadened. Self rim. Fixture and faucet shall be ADA compliant, arranged for disabled use, with center-rear drain.

2. Delta 26C3944 'Lead Free' ***manual*** faucet with swing spout, lever handles, and aerator.

G. UR-1 – Wall-Mounted Bowl with ***Manual*** Flush Valve – Disabled Height

1. Vitreous china Kohler No. K-4991-ET, wall hung, 0.125-1.0 gallon per flush, washout urinal with 3/4" top spud, integral elongated flushing rim, integral trap, wall hangers, and 2" flanged outlet connection. ADA Compliant.

   a. Zurn Series No. Z1221 or No. Z1222 carrier as required for the accepted fixture. Zurn "CB" carrier bank supports acceptable. Mount at ADA Height.

2. ***Manual*** Flush Valve shall be Sloan Royal 186-0.5.

H. WC-1 – Floor-Mounted Water Closet with ***Manual*** Flush Valve – Disabled Height

1. Vitreous china Kohler No. K-96057-SSL, 1.1 to 1.6 gallon per flush, low consumption, siphon jet, elongated bowl, floor mounted closet with 1-1/2" top spud and bolt caps, ADA Compliant.

2. Heavy duty, anti-microbial, commercial grade, open front, plastic seat less cover, with self-sustaining stainless steel concealed check hinges.

3. ***Manual Flush*** Valve shall be Sloan Royal 111-1.28 gallon per flush.

I. WC-2 – Floor-Mounted Water Closet with ***Manual*** Flush Valve– Standard Height

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. HVAC demolition.
8. Equipment installation requirements common to equipment sections.
9. Concrete bases.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.4 Scope:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F .

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete"

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

3.7 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 230500

SECTION 230505 - HVAC SCOPE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. The Contract requirements include the providing of all labor, materials, equipment and appliances, and in performing all operations in connection with the installation of HVAC Construction Work complete for this Project, in strict accordance with this Section of the Specifications and the applicable drawings.

B. At the completion of the project, all systems shall be calibrated, tested, balanced, commissioned, and all systems shall be operating as intended.

C. Contractor is hereby bound by all applicable portions of all Contract Documents and Supplemental Specifications bound herein or included by reference.

D. In all cases where a device or part of equipment is herein referred to in the singular, such reference applies to as many such items as are required to complete the installation.

E. Provide all related and miscellaneous components or appurtenance to make all specified systems complete and functional.

F. Perform all work in accordance with work of all other contractors on this project.

G. Install work in phases during the construction period; coordinate mechanical schedule and operations with other trades and with construction schedule.

H. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING

THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.3 WORK BY OTHERS

A. The following construction and equipment related to the work under this Contract will be furnished or provided by others, unless noted otherwise:

1. Openings in new roof and roof deck. (General Contractor) Openings and patching in existing roof and roof deck by General Contractor.
2. Openings in new exterior walls. (General Contractor) Cutting and patching of existing exterior walls. (General Contractor)
3. Furring around new piping. (General Contractor)
4. Final painting of new interior surfaces. (General Contractor)
5. Recesses and opening in new construction for piping and equipment. (General Contractor)
6. New chases for piping where specifically shown on the drawings. (General Contractor)
7. Funnel and floor drains required for the various equipment. (Plumbing Contractor)
8. Furnish and installation of all line and load side power wiring to all new electrically operated HVAC equipment. (Electrical Contractor) All control and interlock wiring, both low and line voltage shall be included under the HVAC Contract as hereinafter specified for the HVAC equipment, unless noted otherwise.
9. The Electrical Contractor will be responsible for all power wiring and associated terminations to line and load side as well as mounting of all combination starter/disconnects, magnetic starters, VFD's manual starters, disconnect switches, etc. furnished by the HVAC Contractor and external to equipment they are designated to serve.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 230505

SECTION 230506 - BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.3 HVAC WORK

A. The word "building" used throughout these specifications shall be interpreted to mean the entire Building Complex.

B. The actual runs and locations of all piping, ductwork, equipment, etc., shall be determined at the site and shall be installed to meet the various conditions at the building. It is, however, the HVAC Contractor's responsibility to predetermine the exact locations of ductwork, piping, and equipment, and to notify the other contractors accordingly to avoid confliction with other lines and equipment. Any changes necessary to conceal pipes, ductwork or clear pipes and equipment of other trades shall be made without additional expense to the Owner. This Contractor shall be responsible to create ductwork and HVAC piping coordination drawings and distribute to other contractors for coordination and sign off. Refer to Subsection 3.5 for further clarification.

C. No piping, ductwork or equipment shall be installed without first obtaining sign off from the other trades. Should such installation occur and then subsequent conflicts arise, this Contractor shall, at his own expense, remove all that is in conflict and reinstall appropriately.

D. All work shall be executed and all equipment constructed and installed in accordance with the requirements of the State Building Code, the Department of Labor and Industry, ASME, Department of Environmental Resources, Department of Labor, Safety and Health Regulations for Construction, OSHA, National Fire Protection Association, the National Electrical Code as amended to date of bidding, and all federal, state, county and local ordinances and regulations. Nothing contained in these specifications or shown on the drawings shall be construed to conflict with the aforesaid codes, ordinances, or regulations. Certificates of approval shall be obtained from any department issuing same, and shall be turned over to the Owner at the completion of the work. All fees and permits required shall be satisfied and obtained by the Contractor and the cost shall be included in the Contract price.

E. The Contractor shall carefully examine the general building drawings and all mechanical and electrical drawings, and carry on his work so as not to delay or interfere with the work of other trades. He shall obtain in writing from the other contractors such data as is necessary to coordinate his work with other branches. As the work in the building nears completion, all threading, cutting, etc., shall be done where directed by the Architect. Upon completion of the work, all remaining waste materials and rubbish resulting from the Contract work shall be removed from the building and premises. The Contractor shall review the phasing schedule and meet all requirements of the schedule. The building must be kept in use at all times.

F. Where the phrase "or approved equivalent," "or equivalent" or "approved" appears in these specifications, it shall refer to the approval of the Architect on the material or equipment involved.

G. The terms "The Contractor" or "This Contractor" or "the HVAC Contractor" mentioned in these specifications refers to the Contractor responsible for the work and equipment included in these specifications.

H. The General Contractor will provide chases and openings in walls, floors, ceilings, and partitions of new construction to receive pipe lines, risers, ducts, and other equipment insofar as it is possible to predetermine the exact location, but the Contractor shall install his work sufficiently in advance of the building construction to permit his work to be built into place. This Contractor shall advise the General Contractor of the exact size and location of all chases and openings required for the installation of his work, and shall check size and location of all such chases and openings provided by the General Contractor.

I. The HVAC Contractor shall furnish and install all necessary structural steel members for the proper support of all piping, ductwork, and equipment furnished and installed under this Contract.

J. The Contractor shall furnish and place all sleeves required for pipes or ducts passing through new floors, walls and ceilings before such general construction work is built into place. The Contractor shall place all inserts required for hangers and supports, as the construction work progresses, so that unnecessary cutting of construction work will be eliminated.

K. Contractor's particular attention is directed to the Present Building construction. The HVAC Contractor shall furnish and install all necessary structural steel members for the proper support

of all piping, ductwork, and equipment furnished and installed under this Contract. Refer to the Architect's front end specifications for additional requirements.

L. The Contractor shall do all cutting and patching required for the installation of his work.

M. Advance work as rapidly as possible to permit the heating and cooling systems to be used when it is required for all areas of the building. The installation of equipment shall follow the phasing schedule. Instruct the Operating Personnel as to the proper care and maintenance of all systems. However, this Contractor shall operate the new systems until the new systems are complete while the building is under construction. He shall also coordinate the operation of the system with the Owner so that heat remains on in all areas during construction. Provide all required temporary heat as directed by the Construction Manager.

N. Equipment and materials of similar types shall be of the same manufacturer unless specifically indicated otherwise on the drawings or herein specified. All materials shall be strictly in accordance with the quality, style, and sizes as specified herein. Manufacturers' names and plate numbers are given in the specifications to denote a standard of quality, style, size, and type and shall exclude material of other manufacturers. The Contractor shall make final connections between all equipment furnished under this Contract and equipment furnished under other contracts as noted.

O. The materials used throughout shall be those of reputable manufacturers and shall be new and the best of their respective kinds. All equipment, components and materials shall be installed in a neat and workmanlike manner in accordance with best trade practices, manufacturer's recommendations, and applicable codes and standards and by men skilled in each particular branch of the work assigned to them. All work shall be installed subject to the approval of the Architect.

P. A complete list of materials proposed for each installation shall be submitted to the Architect for approval before delivery to the site. The Contractor shall submit samples of materials for approval at the site as requested by the Architect. Such materials may be incorporated into the structures after serving their purpose as samples.

Q. Where the Contractor elects to substitute approved materials or equipment for materials or equipment specified, as the basis of design. The Contractor will be held responsible for all structural, mechanical, and electrical changes required for their installation at no additional cost to the Owner. If additional engineering design is required, the Contractor shall reimburse the design engineer for all costs.

R. The Contractor shall be entirely responsible for all apparatus, equipment and appurtenances furnished by him or his Subcontractors in connection with the work, and special care shall be taken to protect all parts thereof in such manner as may be necessary or as may be directed. Protection shall include covers, crating, sheds, or other means to prevent dirt, grit, plaster, or other foreign substances from entering the working parts of machinery or equipment. Special care shall be taken to keep all open ends of pipes, ductwork, VAV/CAV Boxes and all other equipment, etc., closed while in storage and during installation. Where equipment must be stored outside the building, it shall be totally covered and secured with heavy waterproof tarps

and kept dry at all times. Where equipment has been subjected to moisture, it shall be suitably dried out before placed in service. Materials and equipment shall be stored in areas designated by the Architect.

S. Grades, elevations and locations shown on the drawings are approximately correct; however, the Contractor shall field check and otherwise verify all such data at the site before proceeding with the work. The Contractor shall make necessary survey equipment available at all times and shall make use of such equipment wherever necessary to properly install his equipment.

T. The Contractor shall visit the site and thoroughly acquaint himself with conditions existing at the site before submitting his proposal as he will be held responsible for the installation of the work complete in every detail. The Contractor shall especially review the phasing schedule and ensure compliance with this schedule.

U. All work shown on the drawings and not specifically included in the specifications shall be considered a part of the Contract work. All work included in the specifications and not specifically included on the drawings shall also be considered a part of the Contract work.

V. Carefully examine all drawings included under this Contract and drawings included under other contracts and report any discrepancies noticed to the Architect as this contractor shall be responsible for the HVAC system installation in its entirety.

W. Due to the small scale of the drawings, it is not possible to indicate all offsets, fittings, valves, dampers, access panels, and similar parts which may be required. The drawings are diagrammatic and generally indicative of the work to be installed. The Contractor shall carefully investigate the structural and finish conditions affecting the work and arrange all work accordingly, furnishing necessary parts and equipment as may be required to meet the various conditions.

X. Contractor shall layout his work from dimensions of Architectural and Structural Drawings and actual dimensions of equipment being installed. Layouts in congested areas should not be scaled from Mechanical and Electrical Drawings. Clearances shall be provided on all sides of equipment as required for proper maintenance purposes and as required by the Department of Labor and Industry, OHSA and the National Electrical Code.

Y. The Contractor shall furnish the services of manufacturers' representatives for all equipment furnished under these Contract Documents. The amount of factory service provided by the Contractor shall be as normally recommended and furnished by the various equipment manufacturers unless specified otherwise. Testing of such systems and equipment shall be made under the direct supervision of competent authorized service representatives and the Commissioning Agent. Any and all expenses incurred by the equipment manufacturers' representatives shall be borne by the Contractor.

Z. All equipment and materials shall be manufactured in accordance with national standards established by manufacturer's associations, engineering and testing societies, such as NBMA, NEMA, ASTM, AMCA, ASME, ANSI, ACI, etc., where such standards have been established.

AA. When the installation is reported in writing by the Contractor to be complete and ready for acceptance, tests and inspection shall be made by the Contractor in the presence of the Architect

and Commissioning Agent to ascertain whether it complies with the specifications and Contract, and upon its failure to do so, the Contractor shall at once remedy all defects and shortcomings and any additional tests that may be required shall be entirely at the Contractor's expense. All of the testing work shall be done when and as directed by the Architect before the system is accepted.

BB. Include any excavation and backfill as required for work included under this Contract. Work shall conform to all applicable state and local regulations governing safety provisions at excavation sites.

CC. The Architect/Engineer reserves the right to revise locations of piping, ductwork, locations of equipment, etc., within the building as long as sizes remain the same.

DD. In all cases where equipment and materials are specified in the singular or plural number, it is intended that such reference shall apply to as many such items as are required to complete the installation.

EE. Where piping, ducts, or other equipment pass through existing or new fire or smoke barrier stops, walls, floors, or ceilings, this Contractor shall furnish and install sleeves and shall thoroughly seal openings around sleeves, pipes, etc. with fire and smoke resistant materials. Materials shall be furnished by the HVAC Contractor as required to maintain the fire rating of the walls, partitions, ceilings and floors in accordance with the requirements of NFPA, the state building codes and other applicable codes.

FF. The Contractor shall properly lubricate all moving parts of equipment and appurtenances installed under this Contract.

GG. The Contractor will be responsible for the completion of all work included under this Contract and shall employ skilled and qualified tradesmen as necessary to satisfy all work and trades.

HH. Piping, ductwork, materials and equipment shall be stored in areas as coordinated with the Architect.

1.4 PERMITS, CODES AND INSPECTIONS

A. Obtain and pay for permits and inspections required by laws, ordinances, rules and regulations having jurisdiction for work included under Contract. Obtain certificates of each required inspection as construction progress dictates, and submit same to the Owner's Representative prior to acceptance of the Work.

B. Systems and installation work shall be completed in accordance with the 2015 International Building Code, 2015 International Mechanical Code, and 2015 International Energy Conservation Code.

C. Do work in accordance with all applicable requirements including but not limited to National Fire Protection Association, Underwriter's laboratories, Inc., National Electrical Code, O.S.H.A., and other regulatory bodies having jurisdiction over this class of work. Where applicable, materials and equipment shall bear stamps or seals of NFPA, UL, ASME, AMCA, NEMA, IEEE, NEC, and other recognized regulating agencies.

1.5 DEFINITIONS

A. To clarify and establish relationships for responsibility of work to be performed under this section, designations underlined in the subsequent paragraphs of this Article are defined.

B. Provide shall mean that work or equipment thus described shall be furnished and installed complete and all responsibility and costs relative thereto shall rest with designated Contractor or Subcontractor.

C. Furnish shall mean that equipment thus described shall be purchased by this Contractor or Subcontractor and delivered to job site for installation or erection under this or another contract or subcontract. Furnishing contractor shall be responsible for including installation data and competent supervision assistance to coordinate equipment or components into working and operable systems.

1. Magnitude of installation data and supervision assistance shall be as specifically stated elsewhere herein, or the minimum as interpreted by the Owner's Representative.

D. Contractor as stated herein shall mean HVAC Contractor or Subcontractor unless specifically designated as General Contractor, electrical Subcontractor, etc. If trades or sections of work are prime or sublet, the term "Contractor" shall be used as applicable to Contractor or Subcontractor as defined by the division established by the Contract Documents.

E. Contract as stated herein shall mean HVAC Contract or Subcontract unless specifically designated as General Contract, Electrical Subcontract, etc. If trades or sections of work are prime or sublet, the term "Contract" shall be used as applicable to Contract or Subcontract as defined by the division established by the Contract Documents.

F. Inspect, Inspection, Inspector: To inspect the work of contractors means to observe the work of those contractors and/or subcontractors on all tiers responsible for implementing Consultant's plans, specifications, reports, and other instruments of professional service. An inspector has no authority or responsibility to direct any construction workers, and may not stop the work. An inspector is not responsible for, and does not have the education, training, or experience needed to affect the means, methods, sequences, or operations of construction, or safety procedures attendant thereto.

G. Accepted shall mean accepted by the Owner's Representative.
Approved shall mean approved by the Owner's Representative.
Equivalent shall mean equivalent approved by the Owner's Representative
Directed shall mean directed by Owner's Representative.
HC or HVAC shall mean Heating, & Ventilating Contractor.
PC shall mean Plumbing Contractor.
EC shall mean Electrical Contractor.
GC shall mean General Contractor.*
NEC shall mean National Electrical Code, latest revision.
AFF shall mean Above Finished Floor or Grade to centerline.
FBO shall mean Furnished By Others.
*"General" Contract Work may be performed by various contractors.
See documents for division of responsibilities.

1.6 SHOP DRAWINGS AND SUBMITTALS

A. Refer to Architect's specifications for submittal requirements.

B. At the close of the job, prior to final review, five (5) bound copies of operations and maintenance (O&M) manuals shall be submitted by transmittal to the Engineer for review and acceptance. In lieu of hard copy O&M manuals, the Contractor may submit two (2) copies on CD format containing PDF files. O&M manuals, regardless of format, shall include the following:

1. Equipment warranties.
2. Contractors' warranties.
3. Parts list and manuals for all equipment.
4. Operating instructions (in writing).
5. Written instructions on maintenance and care of the systems.
6. Lubrication and recommended spare parts.

C. Prior to the installation of any equipment or materials, submit shop drawings and manufacturer's data for the items listed in the Submittal Log (Attachment A) in accordance with the Contract Documents. Submittal Log (Attachment A) shall serve as the Contractor's checklist to assure the complete submission of all required shop drawings and manufacturer's data. Additionally, all equipment and materials furnished as part of this Contract shall be submitted for review regardless of whether it is listed on Submittal Log (Attachment A) or not.

D. The submissions are the Contractor's documents, and the Architect's and Engineer's review or acceptance constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.

E. Any deviations from the design documents must be clearly identified so that the Engineer may properly review such items. It shall not be the Engineer's responsibility to search out these discrepancies. If such changes are not properly flagged for the Engineer's review, the Contractor shall be completely responsible for all consequences said changes might result in on the project.

F. Submit Record (As-Built) Drawings. Refer to Paragraph 3.03

1.7 SUBSTITUTIONS

A. Throughout the Specifications, types of materials may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the bidder may assume the phrase "or approved equivalent," except that the burden is upon the bidder to prove such equality. If the bidder elects to prove such equality, he must request the Architect's approval in writing to substitute such item for the specified item, and shall submit supporting data, and samples if required, to permit a fair evaluation of the proposed substitution with respect to quality, serviceability and warranty. All data pertinent to the proposed substitution shall be submitted to the Architect at least 10 days prior to the bid date for evaluation and review purposes. If the Architect accepts the proposed substitution, an addendum will be issued to all bidders advising all bidders that this substitution will be acceptable from all bidders.

B. Substitutions of equipment other than that specified must be very carefully checked to assure that no problems will occur due to dimensional differences, code requirements, connection points, weights, etc. Where the Contractor elects to substitute materials or equipment approved by the Architect for those specified, the Contractor will be held responsible for all architectural, structural, mechanical, and electrical changes required for the installation of the substituted materials at no additional cost to the Owner. All tests required to substantiate the equivalence of the material will be the obligation of the Contractor.

C. When this Contractor desires to furnish equipment of a manufacturer other than that specified or intended, he shall include a complete specification of the substituted item, along with each submission copy of shop drawings, indicating the necessary modifications to the substituted product to satisfy the requirements of the Contract Specifications. Manufacturer's specifications shall be written as close as possible over the Contract Specifications and each paragraph shall bear the same paragraph number as the Contract Specifications so that close comparison can be made. All submissions will be rejected should they not include the comparison specification. Comparison specification shall be submitted for approval 10 days prior to the Bid Date. If prior approval is not obtained, no substitutions will be considered and the Engineer reimbursed for time spent to reject and return such submission.

D. The verification specification shall include the exact wording of the Contract Specification and the revised wording identified properly indicating all the deviations proposed. If no deviations are noted, the Contractor must furnish the material or equipment in accordance with the Contract Specifications.

E. Should the Contractor elect to propose a substitution after the project has been awarded, the Contractor will be billed for the time spent by the Architect and his consultants in evaluating the proposed substitution. This billing shall occur whether the proposed substitution is accepted or rejected and shall be at the rate of the direct cost to the Architect times a 2.5 multiplier.

F. The submissions are the Contractor's documents, and the Architect's and Engineer's approval constitutes an acknowledgment that the documents have been submitted and nothing more. It is the Contractor's responsibility to check his own submissions for compliance with the Contract Documents and job conditions.

1.8 QUESTIONS AND CLARIFICATIONS OF BID DOCUMENTS

A. Bidders shall not rely on any verbal clarification of the Drawings and Specifications. Any questions or clarifications shall be referred to Engineer at least seven (7) working days prior to bidding to allow for issuance of an addendum.

1.9 MECHANICAL PLANS

A. The mechanical plans are intended to be diagrammatic and are based on one (1) manufacturer's equipment. They are not intended to show every item in its exact location, the exact dimensions or all the details of the equipment. The Contractor shall verify the actual dimensions of any specified or substituted materials and equipment to ensure that they will fit in the available space. All apparatus shall be located as closely as conditions will permit and deviations there from shall be made only with the consent of the Engineer and without additional charge. The right is reserved by the Engineer to make any reasonable changes in the location of the

equipment prior to rough-in without invoking additional expense. This contractor shall be responsible to create and distribute for sign-off amongst other trades ductwork and HVAC piping coordination drawings. Refer to Subsection 3.5 for further clarification.

1.10 SPECIAL ENGINEERING SERVICES

A. In the instance of Mechanical and Control systems, such as all major and special equipment, heating equipment, controls, fans, or similar miscellaneous systems and equipment, the installations, final connections and testing of such systems shall be made under the direct supervision of competent authorized service engineers who shall be employed by the respective equipment manufacturer and/or an authorized representative. Any and all expenses incurred by these equipment manufacturers' representatives shall be borne by the Contractor.

1.11 SCHEDULE OF WORK

A. The Contractor shall arrange his work to comply with the Architect's schedule and the published or revised phasing schedule. The Contractor shall submit a complete schedule of work to the Architect for approval at the beginning of the Contract in accordance with the phasing schedule. The schedule shall clearly indicate the proposed order in which the various parts of the work will be undertaken and the estimated time required for the completion of each particular part of the work. All work shall be coordinated with work being performed by contractors of other trades, with the Owner and phasing schedule.

B. The schedule of work may be revised periodically during the course of construction, but each revised schedule must be approved by the Architect.

1.12 EQUIPMENT GUARDS

A. Equipment guards shall be provided for protection at all belts, chains, gears, motors or other moving parts of equipment and machinery installed under this Contract. Guards shall be made up of suitable structural shapes and heavy gauge steel welded together and attached to equipment by removable clips and bolts. Guards shall be neat and substantial and shall be securely attached to equipment. After fabrication, guards shall be cleaned of rust and scale and painted with one coat of metal primer followed by two coats of enamel to match the equipment. Guards shall be easily removable for maintenance and service of equipment. All equipment guards shall conform with OSHA requirements.

1.13 CONCRETE WORK

A. Furnish and install all concrete work related to work included under this contract. Construct concrete forms and bases for the new equipment installed under this contract. Bases and forms shall be of suitable dimensions for all equipment. All concrete work shall be constructed subject to the approval of the Architect. Provide all concrete for repair work related to work included under this Contract.

B. For each piece of floor mounted equipment shown or specified to have a concrete base or pier built on existing floor slab, the Contractor shall install a floor slab of suitable size for the

equipment to rest thereon. Each foundation shall extend 4" above the floor line (unless otherwise indicated on the drawings). Conform with specific equipment manufacturer's recommendations for construction of bases and foundations in each instance.

1.14 LOCATIONS

A. Obtain detailed and specific information regarding location of all equipment, as the final location may differ from that indicated on drawings. Relocate work improperly placed because of Contractor's failure to obtain this information and reinstall as directed, without additional expense to Owner.

B. The design is subject to such revisions as may be necessary to overcome building obstructions. No changes are to be made in location of equipment without prior written approval by Architect.

C. Owner's Representative reserves the right to change locations of equipment, diffusers, registers, thermostats, plumbing fixtures, floor drains, and other items prior to roughing-in, up to a distance of 25 feet without additional charge by the Contractor.

D. Door swings may vary from plans. Take note of actual door swings at time of rough-in. Do not install thermostats, switches or other items behind the swing of any door.

1.15 PAINTING

A. The painting of all exposed pipe, conduits, hangers, and other metal clad equipment provided under this Contract shall be the responsibility of the HVAC Contractor.

B. Factory finished equipment shall be touched up where necessary with same type, texture and color of paint as equipment was originally finished. Touch-up shall be done as directed after all work has been completed and equipment is in final location.

C. General Contractor will paint all patchwork.

1.16 MISCELLANEOUS IRON WORK

A. Furnish and install all miscellaneous iron work including, but not limited to, piping hangers, piping anchors and guides, ductwork supports, and all other equipment supports. All additional structural members shall be furnished and installed to support the heating, ventilating and air conditioning equipment without excessive stress or strain on the building construction. Structural beams and other structural members shall be furnished and installed under this Contract for anchors and guides where the building steel is not available or capable of supporting or anchoring pipe lines and equipment.

B. All equipment and materials furnished and installed under this Contract which are not mounted on bases or floors shall be securely attached and supported from the main supporting structure of the building by metal hangers, clamps and/or brackets. Metal hangers, clamps and/or

brackets shall be of suitable design and of sufficient strength to properly and safely support the materials and equipment involved. Lag screws and bolts shall be used where required at wood construction.

C. Materials

1. Structural steel members for the support of equipment installed under this Contract shall conform to ASTM Specifications A 36 and shall comply with the latest requirements of the American Institute of Steel Construction. Structural steel shall be of standard sections as given in the structural steel manufacturers' handbooks.

D. Priming and Painting

1. All steel and iron work shall be primed with Rust Oleum X 60, or approved equivalent. Before priming all metal shall be thoroughly cleaned free from scale, rust, and dirt.

E. Paint final coat black on all miscellaneous steel installed under this contract by this Contractor.

F. Anchors

1. The Contractor shall provide all anchors, bolts, screws, dowels, and connecting members and do all cutting and fitting necessary to secure the work to adjoining construction. Build in connecting members to masonry, concrete, and structural steel as the new and remodeling work progresses.

G. Supports and Brackets

1. Supports and brackets shall be neatly constructed of structural shapes to adequately support the equipment intended. All supports must be approved prior to installation. Field conditions will regulate the type of support.

1.17 DRAWINGS AND SPECIFICATIONS

A. Carefully examine the drawings and specifications for architectural, structural and other Divisions and Sections of the Work. If any discrepancies occur between the drawings, or between the drawings and specifications, report such discrepancies to the Owner's Representative in writing and obtain written instructions as to the manner in which to proceed. No departures from Contract Drawings will be made without prior written approval of Owner's Representative.

B. Report any discrepancies at least 72 hours prior to submission of a bid. Questions received less than 72 hours prior to date of bid opening will not be answered by formal written addendum. Oral and other interpretations or clarifications will be without legal effect. In the event such discrepancies are not reported and claims for extra charges to any contract result, such claims will be allocated to, and charged to, the Contractor who, in the judgment of Owner's Representative, is the responsible party.

C. In the event of questions or disputes as to intent or meaning of Contract Drawings or Specifications, an interpretation will be given by the Owner's Representative and said interpretation will be final and binding.

D. Specifications and the Drawings are not intended to define all details, finish materials, covers, fittings and special construction which may be required or necessary. Furnish, install and connect same in order to make installation complete and adequate as implied by Specifications and Drawings.

E. Drawings are diagrammatic only and do not show exact routes and locations of equipment. Familiarize yourself with the work of other contractors and arrange your work to avoid conflicts. In the event of conflict of work with existing conditions and work of any other contractor, obtain a new approved location of work from Owner's Representative.

F. Because of the small scale of the Drawings, it is not possible to indicate offsets in piping, conduit and ductwork, pipe, fittings, valves, access panels and similar items which may be required to make a complete operating system. Carefully investigate conditions affecting work and install work in such manner that interferences between pipes, ducts, conduit, equipment, architectural and structural features will be avoided and provide such offsets, fittings, access panels or valves as may be required to meet conditions at the building, and in accordance with applicable codes or governing body so as to avoid such interferences, without additional cost to the Owner.

G. Due to the magnitude of ductwork, number of other utilities, and the limited amount of ceiling space, installation of ductwork shall have precedence over other trades. H.C. shall coordinate installation of systems under his designated contract with all other contractors. H.C. shall provide "interference drawings" to be coordinated with all other contractors. After all contractors have signed off the drawings, turn over one set of prints to the Professional for their records. INSTALL NO DUCTWORK UNTIL "INTERFERENCE DRAWINGS (WITH SIGN-OFFS)" ARE DELIVERED TO AND REVIEWED BY THE PROFESSIONAL.

H. Specifications and drawings are complementary, include work shown on drawings but not specified, and vice versa, as if both shown and specified. All work shown on the drawings and not specifically included in the specifications shall be considered a part of the Contract work. All work included in the specifications and not specifically included on the drawings shall also be considered a part of the Contract work.

I. Consider work new even though no mention is made of new, unless otherwise indicated to the contrary herein or on the drawings.

J. When work has been completed and before final approval, deliver to the Owner's Representative a complete set of prints of contract drawings, properly and clearly marked in colored pencil, to show all changes made in original contract drawings and to represent the work as constructed.

K. Contractor shall layout his work from dimensions of Architectural and Structural Drawings and actual dimensions of equipment being installed. Layouts in congested areas shall not be scaled from Mechanical and Electrical Drawings. Clearances shall be provided on all sides of equipment as required for proper maintenance purposes and as required by the Department of Labor and Industry.

1.18 UTILITIES

A. Be responsible for all coordination and scheduling of construction as necessary for the performance of work under your Contract.

B. Unless otherwise indicated, be responsible for payment of all utility charges for installation/connection/on site construction for work required under your Contract.

1.19 PROTECTION

A. Effectively protect at own expense, such of work, materials or equipment as are liable to loss, damage or injury during the construction period and be held responsible for any such loss, injury or damage until work is fully and finally accepted.

B. Refer to Division 01 for additional requirements.

1.20 SKILLED MECHANICS

A. Install work under the Contract in a neat and workmanlike manner. Work which in the judgment of the Owner's Representative is not so installed: remove and replace to his satisfaction, at your expense. Do work with workmen skilled in their respective trade. Leave areas broom clean and equipment clean of dirt, rust, dust, tags and fingermarks.

1.21 TRADE NAMES

A. Trade names and manufacturer's equipment numbers are used to amplify the specifications and establish type and quality of equipment specified.

B. If substitute equipment offered for use requires material or equipment beyond that shown or required by this contract, it will be provided at Contractor's expense, regardless of trade involved.

C. Substitutions will be accepted as delineated in Division 01.

1.22 PERFORMANCE OF EQUIPMENT

A. Materials, equipment and appurtenances of any kind shown on drawings, hereinafter specified, or required for completion of the work in accordance with the intent of these specifications, will be completely satisfactory and acceptable as regards operation, performance and capacity. No approval, written or verbal, of any drawings, descriptive data or samples of such material, equipment or appurtenances will relieve you of your responsibility to turn over complete installation of heating and ventilating systems to the Owner's Representative in perfect working order and in complete conformance with Drawings and specifications at completion of the work.

B. Any material, equipment or appurtenances, the operation, capacity or performance of which does not comply with requirements of Drawings and Specifications, or which is damaged prior to acceptance by the Owner's Representative will be held to be defective material and will be

removed and replaced with proper and acceptable materials, equipment and appurtenances or put in proper and acceptable working order, satisfactory to the Owner's Representative.

C. Properly lubricate moving parts of equipment and appurtenances. Start up and test them.

D. Operate equipment without objectionable noise or vibration as determined by the Owner's Representative. Should such objectionable noise or vibration be produced and transmitted to occupied portions of the building by apparatus, piping, pumps or other parts of this Work, make necessary changes as approved without cost to the Owner.

1.23 AVAILABLE SPACE

A. Be responsible for verifying dimensions of available space for equipment to be installed under this Contract, and verify dimensions of new equipment prior to delivery. After delivery of new equipment, if it is found that it does not properly fit available space, with required clearances, remove the equipment from the project site and provide equipment to fit available space, at no additional cost to Owner. Be responsible for rigging new equipment required under Contract, through the building, and provide cutting and patching of building construction for rigging of equipment to be installed under Contract, unless otherwise noted.

B. Should the proposed equipment require disassembly for entry through openings, be responsible for disassembling equipment for passage through the openings, and reassembling the equipment for installation at locations as indicated. Be responsible for proper operation and guarantee of disassembled and reassembled equipment; should equipment not operate properly or become damaged due to disassembly and reassembly, replace equipment at no additional cost to the Owner.

C. Carefully schedule delivery of equipment to project site in accordance with the Schedule of Work.

1.24 FLASHINGS

A. The Contractor shall furnish and install roof curbs as required for his equipment.

B. The Contractor shall furnish and install pipe portals for pipes as required.

C. An approved roofing sub-contractor, responsible to the Heating Contractor, shall install flashings at roof curbs and final roofing, to maintain the roof warranty.

1.25 OPENINGS IN WALLS AND ROOF

A. The appropriate Prime Contractor will furnish openings for intakes in the new exterior walls of the building. These are all located and shown on the Drawings and shall be coordinated between this Contractor and the appropriate Prime Contractor. HVAC Contractor shall furnish openings in existing walls and roof for intake and outlets. This Contractor shall coordinate location and site. Openings in existing roofs shall be the responsibility of this Contractor. Final roofing shall be by the appropriate Prime Contractor.

1.26 SOUND CRITERIA

A. Fans-Compressors – Not to exceed 80 decibels at 5 feet from any point on the unit using Sound Level Meter and Method according to ASA Z24.3.

B. Sound Pressure Levels (dB re MicroPascals) (through each octave band) of rooms shall not exceed the following:

	Frequency Bands (HZ)						
Room	63	125	250	500	1000	2000	4000
Offices, Library	55	50	45	40	35	30	25
Corridors	60	55	50	45	40	35	30
Mech Rooms	65	60	55	50	45	40	35

[List other rooms and spaces]

PART 2 - PRODUCTS

2.1 ELECTRIC MOTORS, STARTERS AND SELECTOR SWITCHES

A. Electric Motors

1. All electrical motors furnished and installed under this Contract shall be manufactured by Reliance, General Electric, U.S. Motors, or approved equivalent and shall be of the proper type and frame of the services involved in accordance with the NEMA and Equipment Manufacturer's recommendations. Motors shall be "energy efficiency" type with 1.15 service factor. Motor windings shall be all copper. Where possible, motors shall be permanently lubricated. Where motors must be lubricated, the manufacturer shall furnish the services of a representative to review the lubrication procedure with the Contractor and the Owner and turn over to both of them all of the necessary maintenance literature. Motors and installation shall conform with all applicable requirements of the National Electrical Code. Motors shall be suitable for across-the-line or reduced voltage starting as applicable in each instance. Provide the Electrical Contractor with all motor data to properly size overcurrent protection devices for all combination starters and disconnect switches. The HVAC Contractor shall be responsible for any additional costs to the Electrical Contractor resulting from any changes in motor sizes initiated by the HVAC Contractor, from sizes scheduled on the Drawings.

B. Manual Motor Starters

1. Manual motor starters shall be furnished by this Contractor, for installation by the Electrical Contractor, for single phase fractional horsepower (1/2 horsepower and smaller) motors. Provide all motor electrical characteristics to the Electrical Contractor so the Electrical Contractor may size wiring.

C. Magnetic Motor Starters - Full Voltage

1. Furnish to the Electrical Contractor for installation combination full voltage magnetic starters and fused disconnect switches for all 3 phase motors with service factors of 1.15. Starters shall have three (3) current overload relays and low-voltage release. Starters shall be furnished with hand-off-automatic switch, red run light, overload reset, a set of extra auxiliary contacts consisting of one (1) normally open and one (1) normally closed contacts and a control transformer with 120 volt fused secondary control circuit and fused primary circuit. Starter enclosure shall be NEMA 1 enclosures. Furnish Allen-Bradley Bulletin 512 starters or equivalent as manufactured by Square D, General Electric or Siemens. Disconnect switches shall be horsepower rated to match the horsepower of the motors plus 1.15 service factors connected thereto as required.
2. Where starters are separately mounted, they shall be of the magnetic type as herein specified.
3. All magnetic motor starters for motors connected to the normal/emergency electrical distribution system shall be provided with an adjustable time delay unit. Time delay unit shall be capable of delaying motor starting from 0 to 180 seconds.

D. Safety Switches

1. Safety Switches shall be furnished to the Electrical Contractor for installation.
   a. Safety switches shall be of the fusible type as indicated, quick make, quick break in NEMA Type 1 sheet steel enclosure unless otherwise noted. Switches shall be horsepower rated, and of size and number of poles as indicated on the Drawings. Safety switches shall be of type having a direct mechanical linkage between contacts and operating handle. Safety switches shall be as manufactured by Cutler-Hammer, General Electric, or Square D Company. Fuses for all switches shall be of the UL Class RKI Low Peak as manufactured by the Bussmann Mfg. Division of the McGraw Edison Company. Fuses for motors shall be sized to conform with the motor running current and in strict accordance with the recommendations of the fuse manufacturer.
   b. Where switches are located at the exterior of the Building or in wet locations, they shall be provided with NEMA 3R or 4 weather tight and weather resistant enclosures. Enclosures for switches located in hazardous areas shall be of the appropriate explosion proof type.
   c. Switches used as service entrance switches shall be Underwriters Laboratories listed suitable for Service Entrance Equipment.

E. The H.C. shall coordinate the starter control circuit transformer VA requirements with the ATC contractor prior to ordering starters.

F. Disconnect switches serving remotely mounted soft starters or VFD's shall be furnished with a minimum of one (1) set of normally open auxiliary contacts.

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2.2 ACCESS PANELS

A. The HVAC Contractor shall furnish and install factory fabricated access panels for access to all concealed dampers, damper actuators valves, and other equipment where no other means of access is available. Access panels shall be of appropriate size but not less than 24" flush type, hinged to drop down and out, screwdriver operated, stainless steel in tile work and prime coated sheet steel in plaster or acoustical tile of all types. The HVAC Contractor shall furnish and

install access panels for all equipment installed under this Contract. Exact locations and sizes of panels shall be determined by the HVAC Contractor, but panels shall be located for a symmetrical appearance. Access panels are not required at lift out removable tile ceilings.

B. At locations where access panels are installed in existing or new fire rated construction, access panels shall contain the 1 1/2 hour fire rated "B" label; and in addition, shall also be provided with layers of gypsum wall board in a thickness which will supply an additional one and two hour fire rating equal to the fire rating of adjacent construction.

C. Coordinate with the General Contractor on fire ratings of new and existing construction.

2.3 FIRE STOPPING

A. The following fire stopping requirements constitute minimum requirements of this specification. The Contractor shall be aware of additional requirements by the Construction Manager, which may exceed or supercede this specification.

B. Seal openings of fire rated construction with a material or product that has been tested at an independent testing laboratory, such as UL, FM, etc. Fire stopping shall conform to ASTM E 814 and UL 1479, with fire ratings equal to or exceeding the fire rating of the construction involved. Fire stopping shall be UL classified, and shall be similar to the 3M brand Fire Barrier Penetration Sealing Systems, or approved equivalent. Fire stopping of this type shall also be utilized for openings through smoke rated construction.

C. If desired by the Contractor and approved by local codes, the "Pro Set" piping penetration system also may be utilized. Penetration system shall be UL certified and shall be the "Pro Set" System A. Firestop coupling (sleeve) shall be filled with ceramic fiber material to provide insulation and fire stopping. System shall be capable of maintaining a 3 hour fire rating. Penetration system shall be secure, waterproof, fire rated, and smokeproof and shall allow for pipe expansion and contraction.

PART 3 - EXECUTION

3.1 CLEANING

A. At the completion of the work all parts of the installation shall be thoroughly cleaned. All strainers, vents, pumps, etc., shall be cleaned of all dirt. All temporary replaceable air filters shall be removed and new replaceable air filters shall be installed after the areas have been cleaned for occupancy. The system shall be operated for a sufficient period to remove all grease, metal cuttings, and other foreign matter from the system.

B. Any stoppage or any discoloration or other damage to any part of the building, its finish or furnishings due to the Contractor's failure to properly clean the piping, shall be repaired by the Contractor without cost to the Owner.

3.2 INSTRUCTIONS TO OPERATING PERSONNEL

A. The Contractor and his subcontractors shall satisfactorily complete the systems so that they are functional and operating to the satisfaction of the Architect and Commissioning Agent. All systems, their controls and their sequencing must be demonstrated to the satisfaction of the Architect and Commissioning Agent.

B. The Contractor shall furnish the services of qualified personnel, approved by the Architect and thoroughly familiar with the completed installation to instruct the permanent operating personnel in the proper operation of all systems included under this Contract and the proper care of all equipment and apparatus. These services shall be furnished for a period of five 8 hour days after the operation of the building has been taken over by the Owner.

C. When instructions are provided under this Contract, the Contractor shall have in his possession three copies of an identifying letter which shall list the names of the Contractor's qualified instruction personnel including manufacturers' representatives and subcontractors that will be giving instructions. Likewise on the same letter, spaces shall be provided for the Owner's personnel who will receive the instructions. After instructions have been given and received for each system, the Contractor's representatives and subcontractors shall sign and date the letter, and the Owner's personnel shall sign and date the letter acknowledging that they have received adequate instructions for operating and maintaining the systems and equipment. One signed copy shall be delivered to the Owner, one copy to the Architect, and one copy shall be retained by the Contractor.

D. In addition to the verbal instructions outlined above, the Contractor and his manufacturers' representatives and subcontractors shall furnish written basic instructions indicating the proper operation of each system and associated equipment. Each manufacturer shall also submit a brochure on his equipment including instructions on operation, lubrication, recommended spare parts, and instructions on preventative, routine, and breakdown maintenance. All brochures and formats must be approved by the Architect.

E. The Contractor shall combine the written instructions and the manufacturers' equipment brochures in complete volumes with hard back binders which shall be turned over to the Owner before final acceptance of the Contract work. The Contractor shall furnish the Owner with three (3) complete sets of the manuals indexed by equipment and by manufacturer. The Contractor shall obtain two copies of a signed receipt from the Owner for the written instructions and equipment brochures. One copy of the receipt shall be delivered to the Architect and one copy retained by the Contractor.

F. It is the intent that this entire system with its complement of equipment and auxiliary equipment operate properly in accordance with the design concept and functional intent. It is also the intent that the Owner be given complete instructions for the proper operation and maintenance of the entire system.

3.3 RECORD (AS-BUILT) DRAWINGS

A. The Contractor shall maintain a complete set of Contract Drawings at the site and shall record all deviations in his work (in red ink or pencil) from that indicated on the Contract Drawings. Deviations shall be clearly and accurately recorded so that the Engineer can prepare final record (as-built) drawings using the Contractor’s marked-up drawings. Dimensions shall be recorded using permanent reference points such as columns, building walls and like items. Of particular

importance are the locations of all interior and exterior underground utilities. These record drawings shall be submitted to the Architect prior to final acceptance.

3.4 COORDINATION DRAWINGS

A. Coordination

1. Each Contractor shall familiarize himself with the drawings and specifications of all other contracts relating to this project and shall coordinate with, and be held responsible for his Work which is affected by or dependent on, other contracts.
2. Each Contractor shall provide any dimension, coordination, sleeve, insert, embedded or built-in item, and/or information which is required to be built into, or to complete, the work of another contract in a manner consistent with the Approved Project Schedule. Any additional cost or delay damages arising from a contractor's failure to so furnish or provide shall be borne by that contractor.

B. Coordination Drawings and Procedures

1. Each Contractor shall prepare composite shop drawings and field installation layouts for his work as directed by the Architect to solve tight field conditions except as modified in Paragraph 3 below. Such drawings shall consist of dimensioned plans and elevations and shall give complete information, particularly to size and location of sleeves, attachments, openings, conduits, ducts, boxes and structural interferences.
2. These composite shop drawings and field installation layouts shall be coordinated in the field among the Contractors to verify the proper relationship to the work of other Contractors based on field conditions, and shall be checked for accuracy and approved by the Contractors as directed by the Architect before submission to the Architect for his final approval.

3. HVAC, Plumbing, Fire Protection and Electrical Work shall be coordinated as indicated by the following procedure. Each Contractor shall sign each coordination drawing after all work has been laid out and conflicts resolved. The preparation of coordination drawings and layout Work on the coordination drawings shall be performed at the site by each Contractor.
    a. The HVAC Contractor shall prepare a CAD drawing of each area, at a scale of ¼" inch equal 1'-0", showing his work plan and elevation. The Architect/Engineer can provide CAD Backgrounds of the entire project to the HVAC Contractor for his use. The HVAC Contractor shall layout and show light fixtures on the drawings.
    b. The CAD Drawings referred to in 3. a. above shall then be forwarded to the next succeeding Contractor for layout of their work in the field in the following order; (a) PLUMBING AND FIRE PROTECTION; (b) ELECTRICAL; (c) INTERIOR CONSTRUCTION.
    c. By use of color coding, and layering each succeeding Contractor shall show his work on the referenced CAD Drawing and shall sign same to indicate his satisfaction that there is no interference between his work and that of other Contractors. Colors will be assigned by the Architect.
    d. When all work has been shown and signed off, the HVAC Contractor shall forward each CAD Drawings to the Architect, for review and approval. Prints of approved CAD Drawings shall be distributed to the Contractors by the Architect.
    e. The Architect shall print one copy for each trade for use in the field.

f. The color coded transparency shall be kept at the Architect's field office for future reference in the event of conflict between the trades. At the completion of the project, all color coded transparencies shall be delivered to the Owner for his records.

g. No installation work will proceed until ALL contractors have signed off and agreed to the coordination drawings.

C. Meetings

1. Coordination meetings to resolve interferences in the Work will be held at the site in an area to be provided by the Architect. Representatives of each Contractor shall be present at each meeting. Each Contractor shall provide all necessary resources to insure that the coordination process described herein does not delay the Approved Project Schedule.

D. Each Contractor acknowledges that there may be items of Work which have not been drawn, coordinated, clarified or specified with complete detail in the Contract Documents but which are required for the completion of the Work, as inferable from the Contractor Documents. Any such item, when identified as part of the development of the Work, shall be drawn, coordinated, clarified or specified by the Architect in a manner consistent with contemplated kind, quality and customary standards and provided to the Contractor. When such drawing, coordination, clarification or specification is approved by the Owner, the drawing, coordination, clarification or specification so approved shall thereupon be part of the Contract Documents and the item of Work shall be performed by the Contractor as part of the Work without further action or order of the Owner and without any increase in the Contract amount or time as if such drawing, coordination, clarification or specification were originally included in the Contract Documents.

3.5 MERCURY PROHIBITION

A. The use of mercury as a component of any equipment installed as part of this work is strictly prohibited. Where required, mercury substitutes shall be used in thermometers, thermostats, switches, and other equipment, which might commonly contain mercury.

3.6 WARRANTY

A. The Contractor shall warrant that the materials and workmanship used in the erection of this installation are as herein specified, and he shall provide all labor and materials required to make good any defects in same which become apparent within one year from date of final payment providing such defects are due to faulty materials or workmanship and not to misuse of apparatus by the Owner, his employees, or tenants. Certain equipment shall be warranted or guaranteed for longer than one year from date of final payment where specifically mentioned in these specifications.

B. The equipment and materials manufacturers are expected to recognize that they are responsible for the failure of their products to perform in accordance with data furnished by them or their authorized representatives as well as misrepresentations of such data. When the products have been installed in accordance with the manufacturer's published or written instructions and recommendations and such products fail, then the Contractor and the manufacturers are responsible for replacement of the products and all associated work and materials without

additional cost to the Owner. This warranty applies to all items supplied on the equipment and not just those that are the product of the manufacturer.

3.7 CUTTING AND PATCHING

A. New Construction

1. Except where indicated otherwise, General Contractor will construct all chases and recesses, bulkheads and openings through roof and walls in new construction to accommodate work to be placed under this Contract. Contractor shall locate and size all openings and set sleeves when requested so as not to delay work of the General Contractor. Final responsibility for placement and suitability of such chases, openings and recesses shall rest with this Contractor.
2. Interior openings not located before walls are in place shall be cut at this Contractor's expense. All patching made necessary by said cutting shall be at this Contractor's expense. All holes required after masonry is in place shall be made with a rotary drill and shall be drilled between ribs, beams or joist spacing.

END OF SECTION 230506

SUBMITTAL LOG (ATTACHMENT A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

No.	Specification Number	Description	Manufacturer	Date Received	Action Taken	Date Returned
	23 0506	O&M Manuals				
	23 0506	As-Built Drawings				
	23 0519	Piping Specialties - HVAC				
	23 0523	HVAC Valves				
	23 0529	Hangers and Supports - HVAC				
	23 0533	HVAC Pipe Heat Trace				
	23 0548	Seismic Protection				
	23 0549	Inertia Bases				
	23 0553	Equipment & Piping Identification - HVAC				
	23 0593	Testing, Adjusting, and Balancing of Systems (TAB Reports)				
	23 0700	HVAC Insulation				
	23 0900	Instrumentation and Control				
	23 0910	Laboratory Air Flow Control System				
	23 0993	Sequence of Operation				
	23 0995	Variable Frequency Drives				
	23 1113	Fuel Oil Piping Systems				
	23 1114	Underground Fuel Oil Storage Tank				
	23 1115	Level Gauging – Leak Detection				
	23 1116	Generator Day Tanks and Accessories				

SUBMITTAL LOG (ATTACHMENT A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

No.	Specification Number	Description	Manufacturer	Date Received	Action Taken	Date Returned
	23 1117	Packaged Fuel Filtration System				
	23 1118	Fuel Oil Pumps, Day Tanks and Accessories				
	23 2113	HVAC Piping				
	23 2114	Underground Glycol Chilled Water Piping				
	23 2115	Underground Steam and Condensate Piping				
	23 2123	HVAC Pumps and Accessories				
	23 2223	Steam System Equipment				
	23 2500	Steam Boilers – Convenience Treatment				
	23 2510	Closed Loop Water Treatment				
	23 2520	Cooling Tower Water Treatment				
	23 2530	Glycol Piping Treatment				
	23 3111	Water Softener				
	23 3113	Ductwork				
	23 3115	Existing Ductwork Cleaning				
	23 3300	Ductwork Accessories				
	23 3423	Supply and Exhaust Fans				
	23 3424	Roof Mounted Equipment Accessories				
	23 3433	Air Curtains – In Ceiling Mount				
	23 3434	Air Curtains - Exposed				
	23 3600	Variable & Constant Volume Boxes				

SUBMITTAL LOG (ATTACHMENT A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

No.	Specification Number	Description	Manufacturer	Date Received	Action Taken	Date Returned
	23 3610	Fan Powered VAV Terminal Unit				
	23 3713	Air Outlets & Inlets				
	23 3714	Radiant Infloor Heat (Snowmelt)				
	23 3800	Benchtop Extractor Arms				
	23 4100	HEPA Fan Filter Modules				
	23 5100	Breaching and Stacks - Insulated				
	23 5110	Generator Engine Exhaust System				
	23 5150	Boiler Economizer				
	23 5225	Condensate Surge Tank and Transfer Equipment				
	23 5233	Water Tube Boilers				
	23 5316	Deaerator – Tray Type				
	23 5317	Deaerator – Dual Tray Type				
	23 5700	Shell & Tube Heat Exchangers (Converters)				
	23 5701	Plate & Frame Heat Exchangers				
	23 6416	Centrifugal Water Cooled Chiller				
	23 6423	Air Cooled Scroll Chiller				
	23 6425	Linac Chiller				
	23 6500	Packaged Cooling Tower				
	23 6510	Cooling Tower Accessories				
	23 6520	Non-Chemical Condenser Water Treatment System				

SUBMITTAL LOG (ATTACHMENT A)

Project Name: _____

CJL Project No.: _____ **Trade:** _____

Engineer's Review: A = Reviewed, B = Rejected, C = Furnish as Corrected, D = Comments Attached

Contractor's Required Response: E = Confirm, F = Resubmit

No.	Specification Number	Description	Manufacturer	Date Received	Action Taken	Date Returned
	23 7300	Modular Air Handling Units				
	23 7310	Custom Rooftop Air Handling Units				
	23 8120	Electric & Data Room AC Units				
	23 8126	Indoor Wall-Mounted Ductless Air Conditioners				
	23 8127	In-Ceiling Cassette Air Conditioner – Heat Pump				
	23 8213	Terminal Heating-Cooling Units				
	23 8413	Duct Mounted Steam Injection Humidifier				

SECTION 230513 - MOTOR REQUIREMENTS AND ELECTRICAL DEVICES FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Solid-state, pulse width modulated (PWM), variable frequency drives (VFDs) for speed control of three phase, squirrel cage induction motors.

1.2 SUBMITTALS

A. Field quality-control test reports.

B. Operation and maintenance data.

C. Load-current and overload-relay heater list.

D. Load-current and list of settings of adjustable overload relays.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.4 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE

RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:

1. Ambient Temperature: 0 to 40 deg C.
2. Humidity: Less than 90 percent (noncondensing).
3. Altitude: Not exceeding 3300 feet.

B. Coordinate feature of installed units, and accessory devices with pilot devices and control circuits to which they connect.

C. Coordinate features, accessories, and functions of each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.7 WARRANTY

A. Provide a two year warranty, with all parts and labor included, for each variable frequency drive provided.

B. Provide a two year warranty on each electric motor controlled by a variable frequency drive provided.

PART 2 - PRODUCTS

2.1 MOTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Reliance
2. General Electric
3. U.S. Motor.

B. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

C. Comply with NEMA MG 1 unless otherwise indicated.

D. All electrical motors shall be of the proper type and frame of the services involved in accordance with the NEMA and Equipment Manufacturer's recommendations. Motors shall be "energy "efficiency" type with 1.15 service factor. Motor windings shall be all copper. Where possible, motors shall be permanently lubricated. Where motors must be lubricated, the manufacturer shall furnish the services of a representative to review the lubrication procedure with the Contractor and the Owner and turn over to both of them all of the necessary maintenance literature. Motors and installation shall conform with all applicable requirements of the National Electrical Code. Motors shall be suitable for across-the-line or reduced voltage starting as applicable in each instance. Provide the Electrical Contractor with all motor data to properly size overcurrent protection devices for all combination starters and disconnect switches. Be responsible for any additional costs to the Electrical Contractor resulting from any changes in motor sizes initiated by the HVAC Contractor, from sizes scheduled on the Drawings.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor
2. Split phase
3. Capacitor start, inductor run
4. Capacitor start, capacitor run

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.5 MOTOR CONTROLLERS

A. Provide combination circuit breaker and starter, fused disconnecting switch and starter, unfused disconnecting switch and starter, for each 3 phase motor as indicated by the Schematic Control Diagrams on Contract Drawings.

B. Provide thermal overload switch for each single phase motor unless overload protection is integral with motor.

C. Switches, fuses, circuit breakers, starters and contractors: Use NEMA rated sizes for motor horsepower or connected loads.

D. Special requirements such as auxiliary contacts, holding coil voltages, integral control transformers, number of overload trip elements, etc., are indicated on Schematic Control Diagram of the Contract Drawings.

E. Provide fuses for fuse clips which are part of switches or items included in this Contract; Fusetron or other approved time delay type, or sizes indicated on drawings.

F. Enclosures for switches, breakers, relays, starters, etc., shall be NEMA type for application. Weatherproof enclosures shall be NEMA 3R or as indicated.

G. Provide local disconnect switch of proper number of poles for each motor which is not within sight or is more than 50 feet from motor controller, unless indicated otherwise. See Schematic Control Diagrams.

2.6 MANUAL MOTOR STARTERS

A. Manual motor starters (disconnect switches/thermal overload switches) shall be furnished by the HVAC Contractor to the Electrical Contractor for installation. The HVAC Contractor shall size the manual starter (disconnect switches/thermal overload switches) overload devices.

2.7 MAGNETIC MOTOR STARTERS – FULL VOLTAGE

A. Furnish and deliver to the Electrical Contractor for installation, combination full voltage magnetic starters and fused disconnect switches for all 3 phase motors with service factors of 1.15. Starters shall have three (3) current overload relays and low-voltage release. Starters shall be furnished with hand-off-automatic switch, red run light, overload reset, a set of extra auxiliary contacts consisting of one (1) normally open contact and one (1) normally closed contact and a control transformer with 120 volt fused secondary control circuit and fused primary circuit. Starter enclosure shall be NEMA 1 enclosures. Furnish Allen-Bradley Bulletin 512 starters or equivalent as manufactured by Square D, General Electric or Siemens. Disconnect switches shall be horsepower rated to match the horsepower of the motors plus 1.15 service factors connected thereto as required. Fuses will be furnished and installed by the HVAC Contractor. See "Work by Others", this section.

B. Where starters are separately mounted, they shall be of the magnetic type as herein specified.

C. All magnetic motor starters for motors connected to the normal/emergency electrical distribution system shall be provided with an adjustable time delay unit. Time delay unit shall be capable of delaying motor starting from 0 to 180 seconds.

2.8 SAFETY SWITCHES

A. Safety Switches shall be furnished to the Electrical Contractor for installation.

1. Safety switches shall be of the fusible or non-fusible type as indicated, quick-make, quick-break in NEMA Type 1 sheet steel enclosure unless otherwise noted. Switches shall be horsepower rated, and of size and number of poles as indicated on the Drawings. Safety switches shall be of type having a direct mechanical linkage between contacts and operating handle. Safety switches shall be as manufactured by Cutler-Hammer, General Electric, or Square D Company. Fuses for all switches shall be of the UL Class RKI Low Peak as manufactured by the Bussmann Mfg. Division of the McGraw-Edison Company. Fuses for motors shall be sized to conform with the motor running current and in strict accordance with the recommendations of the fuse manufacturer.
2. Where switches are located at the exterior of the Building or in wet locations, they shall be provided with NEMA 3R or 4 weather tight and weather resistant enclosures. Enclosures for switches located in hazardous areas shall be of the appropriate explosion proof type.
3. Switches used as service entrance switches shall be Underwriters Laboratories listed suitable for Service Entrance Equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Motors drawing less than 250 Watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.

B. Use open drip-proof type motors, except where specifically noted otherwise.

C. Use energy efficient type motors with frame sizes 254T and larger.

D. Select single phase motors (split phase, permanent split capacitor, etc.) by the equipment manufacturer to adequately drive the equipment supplies and suited for the operating conditions.

3.2 NEMA OPEN MOTOR SERVICE FACTORS

HP	3600 RPM	1800 RPM	1200 RPM	900 RPM
1/6 - 1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15
1.5 - 150	1.15	1.15	1.15	1.15

3.3 WIRING METHODS WITHIN BUILDING PERIMETER (INTERIOR)

A. Provide continuous metallic raceways for all interior conductors.

B. Raceways shall be provided where the above conditions cannot be satisfied. Raceways shall be 1/2" trade size or as otherwise shown, required by NEC or to accommodate the size of conductors where multi-conductor cable is used.

C. Raceways and associated items shall be installed concealed except for the following areas and locations where surface installation is acceptable:

1. Electrical Equipment Rooms
2. Mechanical Equipment Rooms
3. Crawl Spaces
4. Vertically above and below surface mounted panelboards
5. Surface metal raceways, where indicated or approved
6. Multi-outlet assembly, where indicated or approved

D. Where concealed work is shown or required by specifications in locations where construction is completed, Contractor shall provide cutting, chasing, patching and restoring of surface as necessary to effect concealed installation.

E. Raceways shall be concealed above suspended ceilings, in walls, partitions, floor or ceiling construction so as not to interfere with or weaken the structure. No raceway larger than 1-1/4" trade size shall be embedded in floor slab construction and only then if a minimum of 1" concrete cover is provided and reinforcing extends 12" on each side of run.

F. Horizontal runs of raceway are not permitted in walls or partitions of poured concrete, masonry or concrete block construction unless the raceway occupies less than 20% of the wall thickness. Raceway shall not be installed in spaces intended for lockers or other built-in equipment. All conduits in cinder or slag fill shall be completely encased in a concrete envelope with a minimum covering of 3". Under no conditions shall raceways be run exposed on floors.

G. All exposed raceways shall be installed parallel to building lines. No diagonal runs will be permitted for exposed raceways.

H. All conduits shall be routed in such manner as to avoid steam or water piping. Where crossings are unavoidable, separation shall be not less than 6". Where such separation cannot be maintained, insulation shall be applied between piping and conduit if specific approval is obtained.

I. Raceways shall be continuous from outlet to outlet and from outlet to cabinet, junction box or pull box, and shall enter and be secured to all boxes in such manner that each wiring system shall be completely enclosed and the enclosure continuously grounded from service entrance to all outlets.

J. Unless otherwise approved, raceways in all locations shall be electrical metallic tubing (EMT) except:

1. Where shown or specified otherwise, or as required by NEC.
2. Nipples shorter than 6" shall be galvanized rigid steel conduit.
3. Raceways in hazardous areas as defined in NEC shall be galvanized rigid steel or intermediate grade conduit installed watertight with watertight fittings and threaded hub cast alloy boxes having gasketed covers.
4. Raceways stubbed through floors in damp or wet locations shall be galvanized rigid steel with threaded fittings, installed watertight.
5. Provide flexible metallic raceway (Greenfield or equal in dry locations; Sealtite or equal in damp locations) for connection to motors, control devices and also electrically operated equipment having adjustable, flexible or vibration isolation mounting details.

Connections to pumps, refrigeration equipment and food service equipment and equipment having liquid coolant or oil reservoirs shall be wet location type. Rigid metal raceways shall terminate at the equipment with a junction box. From this point, flexible metal raceway shall be extended to equipment to be wired and shall be a minimum length of 24" and not longer than 48".

K. Provide internal copper equipment bonding conductor sized per NEC Table 250-122 in all flexible raceway where conductor overcurrent protection exceeds 15 amperes and elsewhere as required by Code.

L. Surface metal raceway, where shown, specified or approved, shall be equal to Wiremold 5700 (or 1000 or 2000 if conductor fill so requires), shall be complete with manufacturer's factory fabricated fittings throughout and shall be secured on not greater than 48" centers.

M. All raceways shall be UL approved for usage intended and each length delivered to job site shall bear UL and manufacturer's label.

N. Junction boxes and pull boxes shall be provided as shown or required to facilitate raceway installation; shall be size and gage as set out in NEC and shall be galvanized steel construction.

O. Conduit bushings for rigid conduits 1-1/2" and smaller may be molded phenolic, zinc or cadmium plated malleable iron. Those for conduits 2" or larger shall be insulating malleable iron Type "B" as made by O.Z. Electrical Mfg. Co., or as approved. Connectors for EMT shall be insulated type.

P. Couplings and connectors shall be set screw or compression type for EMT in sizes 2" and below and shall be threaded type for rigid steel. EMT fittings shall be concrete- tight or rain-tight. Turn set screws toward wall to prevent snagging of clothing, etc.

Q. An approved type expansion or deflection fitting designed for the purpose shall be provided where crossing construction expansion or control joints.

R. All expansion fittings shall be provided with copper bonding jumper or other approved grounding device.

S. Sealing fittings, Crouse Hinds or equal, shall be provided where required by Code for conduits entering hazardous areas and freezer/refrigerator areas.

T. All conduits which are unwired or remain empty shall be provided with a #12 THW draw wire or 200 lb. test yellow braided nylon line, Jet or as approved.

U. In all instances where recessed type panelboards are installed, provide one spare 3/4" conduit for each two future circuits for which "space" or "spare" provisions have been made in panelboard. These conduits shall extend concealed between panelboard cabinet and a convenient location above ceiling construction and left open.

V. In no case shall conduit or raceway be fastened to ducts or piping, or installed in such way as to prevent ready removal of other equipment for maintenance. Keep conduits clear of tube-pull, filter removal and other maintenance clear areas.

3.4 WIRING METHODS (BELOW GRADE)

A. Underground raceways shall be UL approved as electrical raceways and unless otherwise indicated on drawings, shall be the types listed as follows:

1. Polyvinylchloride (PVC). PVC shall be Schedule 40 except where Schedule 80 is noted, or required by Code or by Utility Company. Provide 4" minimum overall concrete encasement for PVC conduit used for utilities and for other loads except where otherwise specifically indicated on drawings.
2. Galvanized rigid steel, factory PVC coated, installed without concrete envelope.

B. In all cases raceways shall be nested, packaged and supported on approved supports prior to concrete pour or backfill.

C. Where underground runs 2" and larger end in a 90 degree bend and a vertical riser conduit, the 90 degree bend and the riser conduit shall be galvanized rigid steel, except where PVC is specifically mandated by a utility company.

D. All raceways shall be standard manufacture. Joints or couplings shall be made watertight. Raceways shall be mandrilled after installation to insure against any possible obstructions.

E. Underground raceways shall be installed at a minimum depth of 2'-0" below finished grade to top of raceway.

F. Provide red plastic marking tape Seton or equivalent, 3" in width and lettered "FIRE ALARM CONDUIT BELOW", 6" below finished grade above all underground raceways.

3.5 MOUNTING HEIGHTS

A. Unless noted or directed otherwise, the following tabulation of mounting heights shall apply except in instances where existing or new equipment, architectural or structural conditions, or equipment size or function dictate that a different mounting height be established. In these instances, Contractor shall obtain directions from Owner's Representative.

B. Indicated mounting heights from finished floor shall be 54" or as directed.

3.6 BALANCING (ELECTRICAL WORK)

A. The system of feeder and branch circuits for power shall be connected to panelboard busses in such manner that loads connected thereto will be balanced on all phases as closely as practicable. Should there be any unfavorable condition of balance on any part of electrical system, Contractor shall make such changes as directed to achieve optimum balance.

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports
2. Trapeze pipe hangers
3. Thermal-hanger shield inserts
4. Fastener systems
5. Equipment supports

B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.

D. See Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.

E. See Division 23 Section "Vibration Controls for HVAC Piping and Equipment" for vibration isolation devices.

F. See Division 23 Section(s) " Metal Ducts" and "Nonmetal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports

2. Thermal-hanger shield inserts
3. Powder-actuated fastener systems

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

1.6 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers

1. B-Line Systems, Inc.; a division of Cooper Industries
2. Carpenter & Paterson, Inc.
3. ERICO/Michigan Hanger Co.
4. Grinnell Corp.
5. National Pipe Hanger Corporation
6. PHD Manufacturing, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. Pipe Shields, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2" beyond sheet metal shield for piping operating below ambient air temperature.

2.5 MISCELLANEOUS MATERIALS

A. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4" of insulation.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
4. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
5. Single Pipe Rolls (MSS Type 41) (adjustable roller hangers): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6" for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4".
2. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Perforated band iron, wire or chain will not be permitted for hangers or supports of pipe.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, concrete inserts, brackets, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation

1. Submit sketches for proposed hangers indicating type of construction, number and size of piping and maximum spacing to engineer for approval.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and show maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

L. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12" long and 0.048" thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

M. Support horizontal piping as follows:

Pipe Size	Max. Hanger Spacing	Hanger Diameter
1/2" to 1-1/4"	6'-6"	3/8"
1-1/2" to 2"	10'-0"	3/8"

N. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.

O. Place a hanger within 12" of each horizontal elbow.

P. Use hangers with 1-1/2" minimum vertical adjustment.

Q. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

R. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

S. Where exposed pipes pass through walls, floors or ceiling of finished rooms, furnish and install steel chromium-plated setscrew type floor, wall or ceiling plates.

T. Seal all openings through walls of air plenum spaces and relief air shafts, where ducts, pipelines, etc. are installed under this Contract to assure airtight plenum spaces. Coordinate all work with contractors of other trades.

U. Where pipes of any type pass through new fire barrier stops, ceilings, floors or walls, thoroughly seal such openings with fire-rated sealant as required to maintain fire-rating of adjacent construction.

V. All necessary structural supports and inserts to hang all piping and equipment shall be provided by this Contractor. Hanger rods shall be securely attached to plates. Where cutting is required for the installation of hangers, piping and supports, all openings must be neatly drilled by the HVAC Contractor. Punching or chipping of concrete will not be permitted. All necessary openings shall be drilled in a location and manner satisfactory to the Architect. All concrete damaged by the HVAC Contractor shall be patched, reinforced or replaced as directed by the Architect. Location of all holes, openings and sleeves shall clear reinforcing steel in floor and roof decks. Coordinate all work with the Architect and shall determine exact locations of all supports and openings, especially vibration isolation.

W. Furnish and install all structural steel members for the support of the piping, ductwork and equipment to suit the structural and vibration isolation conditions. Place all hanger and support inserts in concrete. Special studs "shot" into concrete will not be permitted.

X. Strap hangers, wire hangers, or split-ring hangers will not be acceptable. Clevis hangers are acceptable only as hereinbefore specified for copper tubing.

Y. Insulation shall be installed over band hangers and all openings shall be sealed as hereinafter specified.

Z. Hanger rods installed in conjunction with hangers shall be not less than 3/8" for pipe sizes 1/2" to 2"; Hanger rods shall be larger where recommended by the hanger manufacturer.

AA. Lines 2" and smaller supported on steel joists shall be hung from one joist with beam clamps.

BB. Lines along walls shall be supported on neat, substantial wall hangers, securely attached to construction by means of inserts or expansion sleeves and bolts. Wall hangers shall be similar to Modern Hanger Corporation Fig. 285, Penn Pipe Hanger Co., Arrow Pipe Hanger Co., or approved equal.

CC. All supports directly in contact with copper lines shall be all copper where possible or copper-plated where approved by the Architect. Ferrous metals shall not be used in contact with copper lines. Hangers shall be all-copper as hereinbefore specified.

DD. Where vertical pipes pass through floors in mechanical equipment areas, chases or pipe spaces, construct watertight sleeves made up of a section of Schedule 40 steel pipe extending 2" above the floor.

EE. Where vertical pipes pass through floors in finished spaces, construct watertight sleeves made up of a section of steel pipe of proper length to extend through masonry and terminate flush on finish side.

FF. Where horizontal pipes pass through walls, sleeves shall be as specified above terminating flush with finish on each side.

GG. Where vertical pipes pass through plaster or dry wall ceilings, sleeves shall be No. 18 gauge galvanized steel flush with ceiling.

HH. Where piping is insulated, insulation shall be extended through sleeves. Sleeves shall be at least two sizes larger than the pipe or of suitable dimensions to allow the installation of pipe, insulation and sealant.

II. At all locations, space between sleeve and pipe shall be filled with sealant to level of sleeve. Sealant shall be Dow Corning 3-6548RTV, or approved equal. Conform with manufacturer’s recommended installation procedures.

3.3 SLEEVES

A. Provide sleeves where piping and raceways pass through masonry construction. Extend each sleeve through its respective floor, wall or partitions and cut flush with each surface unless

otherwise indicated for installation of new piping. Pipe sleeves will not be required at core drilled holes. Fill space between pipe and wall of opening with UL approved silicone RTV Foam Sealant "Dow Corning" 3-6548, or equivalent.

B. In floors use sleeves of standard weight steel pipe finished with smooth edges. For other than masonry partitions, through suspended ceilings and plaster surfaces; use 20 gauge galvanized iron sleeves. Fill space between pipes and sleeves with UL approved silicone RTV Foam Sealant "Dow Corning" 3-6548, or equivalent.

C. Properly install and cement sleeves in place.

D. Extend floor sleeves 1" above finished floor in wet areas and in areas having floor drains. Caulk space between floor and sleeves and piping or raceways with UL approved silicone RTV Foam Sealant "Dow Corning" 3-6548 and waterproofing compound as approved.

E. Where piping or raceways pass through waterproofed floors and walls; design sleeves so that waterproofing can be flashed into and around the sleeves.

F. Provide chromium plated steel, hinge type floor and ceiling plates with spring retainers on piping passing through walls, floors and ceilings in finished areas.

G. Fit sleeves through exterior walls below grade with seals equal to Thunderline "Link Seal" or OZ type FSK.

3.4 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

3.5 FASTENINGS

A. For fastenings and attachments such as screws, bolts, nuts, etc.: use non-ferrous silicon bronze, or galvanized or cadmium plated steel. Where such devices are not commercially available in non-ferrous metals, or in steel with a protective coating: use fastenings and attachments made of such materials or so protected to offer maximum protection against deterioration from age, weather and dampness. Where subject to weather or wet locations use stainless steel bolts and screws.

B. Do not support items by nylon ties, tape or tie wire, or perforated metal straps. Where items are to be fastened to masonry construction: do not use wooden or fiber plugs. Use screws or bolts in conjunction with approved lead-alloy expansion sleeves (Hilti or equivalent). As desired use approved plastic anchors for #10 and smaller screws, up to static loads of 20 lbs. per screw. Insert anchors fully in solid masonry (not in plaster, etc.).

3.6 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in pipe shafts, and suspended ceiling spaces are not considered exposed.

3.7 MISCELLANEOUS IRON WORK

A. Furnish and install all miscellaneous iron work including, but not limited to, piping hangers, piping anchors and guides, ductwork supports, and all other equipment supports. All additional structural members shall be furnished and installed to support the heating, ventilating and air conditioning equipment without excessive stress or strain on the building construction. Structural beams and other structural members shall be furnished and installed under this Contract for anchors and guides where the building steel is not available or capable of supporting or anchoring pipe lines and equipment.

B. All equipment and materials furnished and installed under this Contract which are not mounted on bases or floors shall be securely attached and supported from the main supporting structure of the building by metal hangers, clamps and/or brackets. Metal hangers, clamps and/or brackets shall be of suitable design and of sufficient strength to properly and safely support the materials and equipment involved. Lag screws and bolts shall be used where required at wood construction.

C. Materials

1. Structural steel members for the support of equipment installed under this Contract shall conform to ASTM Specifications A-36 and shall comply with the latest requirements of the American Institute of Steel Construction. Structural steel shall be of standard sections as given in the structural steel manufacturers' handbooks.

D. Priming

1. All steel and iron work shall be primed with Rust-Oleum X-60, or equivalent. Before priming all metal shall be thoroughly cleaned free from scale, rust, and dirt.

E. Anchors

1. Provide all anchors, bolts, screws, dowels, and connecting members and do all cutting and fitting necessary to secure the work to adjoining construction. Build in connecting members to masonry, concrete, and structural steel as the new and remodeling work progresses.

F. Supports and Brackets

1. Supports and brackets shall be neatly constructed of structural shapes to adequately support the equipment intended. All supports must be approved prior to installation. Field conditions will regulate the type of support.

3.8 EQUIPMENT BASES, SUPPORTS

A. Unless otherwise indicated, provide construction of concrete equipment foundations required for equipment furnished under this section.

3.9 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads
2. Isolation mounts
3. Restrained elastomeric isolation mounts
4. Housed spring mounts
5. Spring hangers

1.2 SUBMITTALS

A. Product Data: For each product indicated.

1.3 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation.
6. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4" thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 VIBRATION-CONTROL DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

E. Hang ceiling suspended fans by means of vibration hangers consisting of a steel housing or retainer incorporating a steel spring and neoprene isolator.

3.2 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Equipment labels
2. Valve tags
3. Pipe labels
4. Duct labels

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton

B. Brimar

C. Bunting

D. Brady Co.

E. Kimball Systems

2.2 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Laminated Plastic Nameplates: 3" x 1" Laminated three-layer plastic with engraved black (1/4" high) letters on white background. Engraved micarta with pressure-sensitive backing and shall be nonabsorbent, non-porous and colorfast.

C. Plastic Tags: Laminated three-layer plastic with engraved black (1/4" high) letters on white background. Tag size minimum 1" x 2" square.

D. Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	Length of Color Field	Size of Letters
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"

E. Stencil Paint: In accordance with Division 09, semi- gloss enamel.

F. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

G. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6" wide by 4 mil thick, manufactured for direct burial service.

H. Do not use stick on labels.

2.3 VALVE TAGS

A. Tag each new valve, controller, and other devices requiring adjustment and affecting the performance of equipment furnished under this Contract. Prepare a list giving the number of each valve, its location, and the equipment or portion of the system tagged. The list shall be enclosed in a metal frame with glass and shall be hung where directed. Tags shall be of aluminum or brass, 2" in diameter with numbers as large as possible and attached by short, small link aluminum or brass chains or "S" hooks. Numbers and tags shall be coordinated with those being installed under this Contract.

B. Prepare a typewritten list giving the number of each valve, its location, and the equipment or portions of the system controlled. The list shall be enclosed in a metal frame with glass. The list shall be hung at location directed by Architect.

C. Contractor shall match existing identification nomenclature presently in use at facility.

2.4 EQUIPMENT IDENTIFICATION

A. Where valves, cleanouts, dampers, etc., are located above removable tile ceiling or above access panels, furnish and install identification labels on the corners of the access panels or removable ceiling tiles. Labels shall be provided with the word "VALVES", "RELAY", "DAMPER", etc., so that the equipment may be readily located in the future.

B. Adhesive backing shall be chemically compounded to hold tight and fast at wide temperature extremes. Labels shall be additionally secured with screws or rivets. Flexible plastic punched tapes will not be acceptable. Labels shall be coordinated with those being installed under other contracts.

C. All major pieces of HVAC equipment shall include, at a suitable and accessible observation point on the equipment, a manufacturer's stamped brass or aluminum identification plate, with all pertinent capacity data stamped on the plate. Identification plate shall include all specific data, such as model number, serial number, motor data, horsepower, capacities, sizes, amperes, power consumption, speed, flows in GPM, temperatures, working pressures, operating pressures, and similar factors as applicable. In addition, pumps shall include total head in feet and impeller sizes.

D. The Contractor shall be responsible for furnishing and attaching an identification plate for the above mentioned major equipment if not provided by the equipment manufacturer.

E. Equipment marking tags shall be engraved phenolic, 1/16" thick, four edges bound, black with white lettering. The tag shall be securely mounted to the equipment with minimum of two (2) – 3/8" long No. 3 screws. Tags shall provide such information as: "Exhaust Fan – EF2,", "Air Handling Unit – AHU 1" and include "date of installation and project number".

F. All remote starters and disconnects shall also be tagged with the equipment they serve. (i.e. "AHU-1", EF-1", etc.)

G. The installations will not be considered acceptable unless identification plates and nameplates are attached.

2.5 PIPING IDENTIFICATION

A. All piping insulated and uninsulated, installed throughout this Contract, shall be stenciled with the name of the service, such as HWS, CWS, etc., and with an arrow indicating the direction of flow.

B. Stenciled letters shall in general, be plain black and shall be located near each branch connection, at each valve, at each change in direction, on each side of walls or floors, and at least every 20' on straight runs of pipe. On smaller runs of piping, center the designations. In

lieu of stenciling, snap-around pipe markers by Seton Nameplate Co. "Set Mark", or approved equivalent may be utilized. Identification and colors shall comply with ANSI A13.1. Snap-around markers shall be suitable for exterior use where utilized.

C. Where pipes are adjacent to each other, markings shall be neatly lined up. All markings shall be located in such a manner as to be easily legible from the floor. Markings on black pipes shall be white.

2.6 DUCT IDENTIFICATION

A. All ductwork insulated and uninsulated, installed throughout this Contract, shall be stenciled with the name of the service, such as supply, exhaust, etc., and with an arrow indicating the direction of flow.

B. Stenciled letters shall in general, be plain black and shall be located near each branch connection, at each change in direction, on each side of walls or floors, and at least every 20' on straight runs of duct.

C. Where ducts are adjacent to each other, markings shall be neatly lined up. All markings shall be located in such a manner as to be easily legible from the floor.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare surfaces in accordance with Division 09 for stencil painting.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosion-resistant mechanical fasteners, adhesive not acceptable.

B. Plastic Tags: Install with corrosion-resistant chain.

C. Stencil Painting: Apply in accordance with Division 09.

D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

E. Controls: Identify control panels and major control components outside panels with plastic nameplates. Secured with screws. Do not use adhesive.

F. Valves: Tag each valve in main and branch piping, but no individual shutoff or local control valves at equipment.

G. Piping: Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on

straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

3.3 VALVE CHART AND SCHEDULE

A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

B. Provide whiteprint schedules framed under glass, showing number, location, color code and designation of piping controlled, mounted in a designated location. Provide two additional copies of valve schedule in hardback covers to Owner.

C. Mark pipes and tag valves in accordance with the following table.

Service	Marking	Tag
Drain	Drain	---
Refrigeration Suction	Refrigeration Suction	R.S.
Refrigeration Liquid	Refrigeration Liquid	R.L.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Balancing Air Systems
   a. Constant-volume air systems

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. ASHRAE – 2011 Applications Handbook: Chapter 38, Testing, Adjusting and Balancing.

C. NEBB – Procedural Standards for testing, Balancing and Adjusting of Environmental Systems.

1.4 SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.

2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
3. All field work by the Testing, Adjusting, and Balancing Firm shall be under the direct supervision of a registered Professional Engineer, licensed to practice in the Commonwealth of Pennsylvania and who is a full time employee of the firm.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 TESTING AND BALANCE REPORT

A. Provide the services of an independent qualified testing, adjusting and balancing firm as approved by the Owner’s Representative. The testing, adjusting and balancing firm shall submit evidence that it has been engaged in this type of service for a minimum of five (5) years and that it has balanced systems of comparable size and complexity as specified for the project.

B. HVAC Contractor and balancing firm are responsible for testing, adjusting and balancing air and water systems and balancing and adjusting existing equipment and systems where this equipment and systems are being altered under this Contract.

C. Coordinate the balancing work with all other Contractors, Temperature Control Subcontractor, Owner’s Representative and the Owner. Temperature Control Subcontractor shall adjust controls. Perform balancing of the heating systems when outdoor air temperature is averaging below 30°F and the cooling systems when outdoor air temperature is above 80°F.

D. Contractor shall furnish and install new sheaves, if required, to balance the air systems, at no additional cost.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts and Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation. Verify that dirty filters have been removed and that new clean filters are in place.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure Total Airflow
    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
2. Measure fan static pressures as follows to determine actual static pressure:
    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    a. Report the cleanliness status of filters and the time static pressures are measured.
4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling

units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.
   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.10 FINAL REPORT

A. General: Prepare and submit four (4) copies of a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Balancing stations.
6. Position of balancing devices.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Insulation Materials
    a. Flexible elastomeric
    b. Mineral fiber
2. Insulating cements
3. Adhesives
4. Mastics
5. Sealants
6. Factory-applied jackets
7. Field-applied jackets
8. Tapes
9. Securements
10. Corner angles

B. Related Sections

1. Division 21 Section "Fire-Suppression Systems Insulation."
2. Division 22 Section "Plumbing Insulation."

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING

THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. 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: Subject to compliance with requirements, provide one of the following:
   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacke]. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Duct Wrap.
   d. Manson Insulation Inc.; Alley Wrap.
   e. Owens Corning; All-Service Duct Wrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Minimum 0.02" thick.

2.5 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1" by 1", PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040" thick, minimum 1" by 1", aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

2.6 FITTING COVERS/INSULATION

A. Products: Subject to compliance with requirements. Provide one of the following:

1. HamFAB (Leighton, PA)
2. Elolux (Astoria, NY)

B. Preformed fiberglass, mitered fiberglass, calcium silicate. Protect fittings by field applied fitting covers as necessary. Loose packed and wrapped insulation covered with plastic fitting covers is not acceptable.

PART 3 - EXECUTION

3.1 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 apply 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.

3.2 GENERAL 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. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3" wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4" o.c.

3. Overlap jacket longitudinal seams at least 1-1/2". Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge.
   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.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4" beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices
2. Testing agency labels and stamps
3. Nameplates and data plates
4. Manholes
5. Handholes
6. Cleanouts

3.3 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. 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".
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. 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".

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate 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.
6. 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.
7. 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.
8. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2" over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation

1. Concealed and exposed supply and outdoor air.
2. Concealed and exposed exhaust air.

B. Items Not Insulated

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated items.
3. Flexible connectors.
4. Vibration-control devices.

3.6 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed and exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2" thick and 1.5-lb/cu. ft. nominal density.

B. Concealed and exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket 2" thick and 1.5-lb/cu. ft. nominal density.

C. Concealed and exposed exhaust air duct and plenum insulation: Mineral fiber blanket, 1-1/2"thick, and 1.5 lb/cu.ft nominal density.

3.7 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

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

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.8 INDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric, 3/4" thick.

B. Drain piping: 1/2" thick flexible elastomeric.

3.9 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed

1. PVC: 20 mils thick.

3.10 METAL SHIELDS

A. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts between the pipe and the insulation shields. Use inserts of equal thickness to the adjacent insulation and vapor seal each insert. Insulation inserts shall be no less than the following lengths:

1-1/2" to 2-1/2" IPS 10" long

3.11 Replace all existing insulation damaged due to installation of new work, alterations, etc.

END OF SECTION 230700

SECTION 232301 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment. Schematic refrigerant piping diagram shall be prepared by same manufacturer as equipment served.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.4 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE

RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PIPING

A. Use clean, hard drawn, factory plugged type ACR (air conditioning refrigeration) copper tubing with wrought copper fittings. Installation of refrigerant piping requires that refrigerant piping be silver soldered. Therefore, it is incumbent that the Contractor provides valves and specialties which can be silver soldered without damaging internal parts. Disassemble valves and specialties before soldering. Appeal of this requirement after installation is completed will not be considered and work not conforming to specifications will be directed to be replaced. Silver solder composition: 15% silver, 80% copper, 5% miscellaneous metals and shall have maximum melting point of 1160°F. SIL-FOS as manufactured by Handy & Harmon, J.W. Harris Co., Inc., or equivalent. Do not use lead or tin base solders. Final connections of refrigerant lines of 1/2" O.D. and under may be made with flare fittings.

B. Refrigerant piping and equipment shall be installed by qualified mechanics, who have had at least two years experience in refrigeration installation.

C. Copper tubing becomes greatly oxidized when subject to temperatures required for silver soldering and/or low temperature brazing. Oxidation within the copper tubing is detrimental to refrigeration systems. Immediately prior to soldering, purge the piping with nitrogen. Upon completion, test and evacuate system to within 2 millimeters of mercury and charge. After system is in operation for two weeks, contact the Owners Representative and in the presence of the Owners Representative remove the cartridges from the liquid line and suction line filter driers to demonstrate that purging and soldering was properly carried out. If oxidation is found, flush the system with the Freon II method until clean.

2.2 VALVES

A. Manual stop valves and check valves: as manufactured by Henry Valve Co., Mueller Brass Co., Superior Valve Co., or equivalent. Manual stop valves in liquid lines: packless type with handwheels.

2.3 SIGHTGLASSES

A. Install sightglasses in liquid line serving each DX coil, and use double ported type having sightglass sealed into forged bronze body. SEE-ALL model as manufactured by Sporlan, Superior Valve, Henry Valve Co or equivalent.

2.4 FILTER-DRIERS

A. Install filter-driers: Refrigerant type installed in liquid line near each cooling coil with flared ends. Size filter-drier as recommended by manufacturer for service and capacity of system; connection size not less than line in which installed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Reroute piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Provide non-conducting dielectric connections when joining dissimilar metals.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access to concealed valves and fittings.

I. Shutoff valves shall be provided on all lines at the condensing units and the cooling coils.

J. Insulate piping; refer to Section 230700.

K. Fully charge completed system with refrigerant after testing.

L. System shall be complete with necessary shutoff valves, purge valves, charging valves, liquid line solenoid valve, sight glasses, dryers, vents, traps, fittings, and other accessories required for a complete installation. Refrigerant piping shall be sized as recommended by the equipment manufacturer, and based on total friction loss equivalent to not more than 2 degrees F for hot gas line, and 1 degree F for liquid line. Refrigeration piping shall be hard temper Type L copper tubing assembled with long radius wrought copper solder end fittings or SAE fittings. Refrigeration lines shall be properly supported.

M. The Contractor shall include initial startup of the system, final checkout and instruction to the Owner's operating personnel. Maintenance service for the refrigerant piping system shall also be included in the Contractor's bid for the first year from date of final acceptance by the Owner. The exact arrangement, sizes and other details shall be in strict accordance with the equipment manufacturer's diagrams which shall be submitted for approval.

3.3 APPLICATION

A. Provide line size liquid indicators in liquid line.

B. Provide filter-driers in liquid lines with flared connection.

C. Submit shop drawings on refrigeration equipment, complete wiring diagrams and refrigerant piping diagrams. Install wiring and piping in complete accordance with manufacturer's recommendations.

D. Refrigerant piping diagrams shown on the drawings are the minimum acceptable required piping and accessories and generally show single piping circuits. During bidding stages, obtain circulating requirements of various refrigeration equipment vendors and include costs for installation of piping and accessories in bid proposal.

E. Provide access fittings in piping system at suction line near each DX coil.

3.4 FIELD QUALITY CONTROL

A. Refrigerant piping and equipment shall be installed by qualified mechanics, who have had at least two years experience in refrigeration installation.

END OF SECTION 232301

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Rectangular ducts and fittings
2. Round ducts and fittings
3. Sheet metal materials
4. Sealants and gaskets
5. Hangers and supports

B. Related Sections

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

12. Hangers and supports, including methods for duct and building attachment **[restraints,]** and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
   a. Lighting fixtures
   b. Air outlets and inlets
   c. Speakers
   d. Sprinklers
   e. Access panels
   f. Perimeter moldings
7. Ductwork shall not be installed until all contractors have signed off on coordination drawings.

1.4 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 LOW VELOCITY DUCTWORK (2 INCH WG POSITIVE OR NEGATIVE AND VELOCITIES LESS THAN 2000 FPM)

A. All low velocity ductwork shall be constructed and installed in strict accordance with the recommendations and details of SMACNA (Sheet Metal and Air Conditioning Contractors' National Association, Inc., 8224 Old Courthouse Road, Tysons Corner, Vienna, Virginia 22180), except where these Specifications exceed SMACNA requirements. Low velocity ductwork shall consist of outdoor intake ducts, supply ducts, exhaust ducts, transfer ducts, relief air ducts, and return ducts. Do not use snap lock stove pipe type round ducts, adjustable elbows, dovetail or spin connections.

B. No variation of duct configuration or sizes permitted except by written permission of Engineer where NC levels are critical such as theaters.

C. All miscellaneous transitions, shapes and accessories have not been indicated due to the scale of the Drawings; however, the Contractor shall install all sheet metal accessories to complete the systems. Special care shall be exercised to provide tight fitting, well-fabricated well-braced ductwork systems. Adjustment mechanisms, controls and dampers of all kinds must be accessible.

D. Drive slip joints shall not be used for joint connections unless the Contractor thoroughly tapes each joint with 3M or approved equal 4" wide vinyl impregnated cloth duct tape with adhesive back. Two 2" wide overlapped tapes may be used in lieu of 4" wide tape. Taped drive slip joints may be used on ducts up to and including 18" only.

E. All new low velocity ductwork shall be constructed to SMACNA 2" wg pressure class standards and shall be neatly built, rigidly braced with structural shapes to prevent vibration and made up of the following gauges: Exposed ductwork shall be one (1) gauge heavier than that listed.

Steel Gauge	Aluminum Thickness	Maximum Size, Inches	Type of Transverse Joint Connections	Bracing
24	.020"	Up to 12	Plain S Slip, Pocket Lock or Bar Slips on 8'-0" Centers	None
24	.025"	13 to 18	Plain S Slip, Pocket Lock or Bar Slips on 8'-0" Centers	None
24	.025"	19 to 30	Hemmed S Slip, 1" Pocket	1" x 1" x 1/8" angles

Steel Gauge	Aluminum Thickness	Maximum Size, Inches	Type of Transverse Joint Connections	Bracing
			Lock or 1" Bar Slips on 10'-0" Centers	5'-0" OC max.
22	.032"	31 to 42	1" Pocket Lock or 1" Bar Slips, on 5'-0" Centers	1" x 1" x 1/8" angles 5'-0" OC max.
22	.032"	43 to 54	1-1/2" Angle Connections or 1-1/2" Pocket or 1-1/2" Bar Slips on 5'-0" Max. Centers	1-1/2" x 1-1/2" x 1/8" angles 5'-0" OC max.
20	.040"	55 to 60	1-1/2" Angle Connections or 1-1/2" Pocket or 1-1/2" Bar Slips on 5'-0" Max. Centers with 1-3/8" x 1/8" Bar Reinforcing	1-1/2"x 1-1/2" x 1/8" angles 5'-0" OC max.
20	.040"	61 to 84	1-1/2" Angle Connections or 1-1/2" Bar Slips on 5'-0" Max. Centers with 1-3/8" x 1/8" Bar Reinforcing	1-1/2"x 1-1/2" x 1/8" angles 4'-0" OC max.
18	.051"	85 to 96	1-1/2" Angle Pocket Connections or 1-1/2" Angle Slips or 1-1/2" Bar Slips 5'-0" Max. Centers with 1-3/8" x 3/16" Bar Reinforcing	1-1/2" x 1-1/2" x 3/16" angles 3'-0" OC max.
18	.051"	Over 96	2" Angle Pocket Connections or 2" Angle Slips 5'-0" Maximum Centers with 2" x 1/4" Bar Reinforcing	2" x 2" x 1/4" angles 2'-6" OC max.

F. Round low velocity ductwork shall be fabricated of galvanized steel with lock-type spiral seams in accordance with SMACNA details and steel gauge thickness as listed in the SMACNA Manual. Duct system shall be as manufactured by United Sheet Metal, Semco, or approved equal.

G. All joints in ductwork shall be airtight and shall be constructed in accordance with SMACNA recommendations, except where SMACNA recommendations are exceeded by these Specifications. Seal all low pressure ducts with United McGill Duct seal for Seal Class B.

H. All connections between motor-operated equipment and ductwork shall be made through 20 oz. fire-resistant canvas throats, "Ventfab," "Durodyne," or approved equal. A short length of flexible duct (24" maximum) will be permitted to connect diffusers to low pressure ductwork. Flex duct and collar in duct shall be not less than diffuser collar size and held in place with strap or clamp.

I. All ductwork shall be supported by hanger straps, angles, rods, or bands, attached, sized and spaced in accordance with the SMACNA duct construction standards. Standard sheet metal practices listed and shown in the SMACNA "Duct Manual" shall apply to work to be performed.

J. Branch duct take-offs from rectangular ducts shall be full size bellmouth type (such as the Buckley Air-Tite Bellmouth Take-Off) with a heavy duty volume regulator for round branch ducts and 45° shoe tap type with volume regulator for rectangular branch ducts.

2.2 CASINGS

A. Fabricate casings in accordance with SMACNA Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors of plenum are acoustically insulated, provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 6 X 6 inch.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gauge 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 gauge.

2.3 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings. Duct sizes listed are inside dimensions. For lined ducts maintain sizes inside liner.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials

M. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

N. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout.

O. During construction provide temporary closures of metal or taped polyethylene or open ductwork to prevent construction dust from entering ductwork system.

P. Install flexible canvas connections at inlet and outlet of all fans. Flexible connections: UL Listed fire-retardant neoprene coated woven glass fabric to NFPA 90 approximately 6" wide crimped into metal edging strip. Where installed in outside atmosphere, use hypalon coated connections in lieu of neoprene coated. Provide minimum of 1" slack to insure that no vibration is transmitted

Q. Do not use flexible ducts as elbows.

R. Do not use flexible ducts in return or exhaust duct systems.

S. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

T. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Do not install ducts above electrical panelboards, switchgear, or other electrical equipment.

U. Pack space between duct and masonry with UL approved mineral wool where ducts pass through floors or fire partitions.

V. At ductwork penetrations of exterior walls, pack space between duct and wall with UL approved mineral wool. Install proper size backer rod and caulk exterior exposure with silicone base caulking (1/2" minimum depth). Make seal weathertight.

W. In existing building: where existing cross-bracing interferes with duct installation, coordinate alterations to cross bracing with Architect.

X. At all duct shafts from Mechanical Rooms, seal spaces between ducts by caulking with loose fiberglass insulation faced with mastic. Large spaces shall be closed off with sound-lined 16 gauge galvanized sheet metal.

Y. All ductwork serving moisture laden or other condensable vapor laden air streams shall be sealed liquid tight to prevent leakage. Any leaking ductwork shall be replaced and all damage caused by leakage shall be the responsibility of the Contractor.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. 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."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Conditioned Space, Supply/Outdoor-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Conditioned Space, Exhaust Ducts: Seal Class B.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.7 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SYSTEM TESTING

A. Test duct systems after erection of system with all openings blanked. Systems shall be substantially airtight at this pressure. Provide blower, instruments, etc., necessary to establish results. Owner's Representative must be present at pressure test, and test results are subject to his approval. Previously test the system and maintain this test pressure before test is performed for approval of Owner's Representative.

B. All medium and high pressure duct systems shall be tested at 1-1/2 times operating pressure. Maximum allowable leakage shall be not more than 5% of total design air quantity of systems at 6" H_2O.

C. First shipment of low pressure ductwork delivered and erected at the project site shall be tested. Two additional random tests shall be conducted at request of Owner's Representative during remainder of project with test locations as determined by Owner's Representative. Low pressure duct systems shall be tested at 2.0 inches H_2O. Maximum allowable leakage shall be not more than 3% of total design air quantity systems.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Manual volume dampers
2. Control dampers
3. Fire dampers
4. Smoke dampers
5. Turning vanes
6. Duct-mounted access doors
7. Flexible connectors
8. Flexible ducts
9. Duct accessory hardware
10. Combination fire/smoke dampers

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE

RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. McGill AirFlow LLC.
   d. Pottorff; a division of PCI Industries, Inc.
   e. Ruskin Company.
   f. Titus.
   g. Krueger
   h. Tuttle & Bailey
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames
   a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.

b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Stainless steel sleeve.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.3 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Ruskin Company.
7. Young Regulator Company.

B. Frames

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

C. Blades

1. Multiple blade with maximum blade width of 8 inches.
2. Parallel- and opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries.; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. Pottorff; a division of PCI Industries, Inc.
6. Prefco; Perfect Air Control, Inc.
7. Ruskin Company.
8. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 6-inch wg static pressure class and maximum 4000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with interlocking blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners. Frame for medium/high velocity ductwork shall be welded.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.

2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

K. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F rated.

L. Closure spring: Stainless steel.

2.5 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection.

D. Frame: Curtain type with interlocking blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034" thick galvanized steel; with mitered and interlocking corners.

E. Blades: Roll-formed, horizontal, interlocking, 0.034" thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.052" thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

I. Damper Motors: two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections.
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

K. Accessories

1. Auxiliary switches for signaling.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Greenheck Fan Corporation
4. McGill AirFlow LLC
5. Pottorff; a division of PCI Industries, Inc.
6. Ventfabrics, Inc.
7. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door
   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel. (where noted on drawings)
   d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks
   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.

b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

4. Doors in kitchen exhaust ducts, designed specifically for this service with greasetight gasketing and minimum of 16 gage black steel.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Ventfabrics, Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.8 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.

2.9 COMBINATION FIRE/SMOKE DAMPERS

A. Furnish and install at locations shown on plans, or as described in schedules, combination fire/smoke dampers meeting or exceeding the following specifications. Frame shall be a minimum of 16 gauge galvanized steel formed into a structural hat channel reinforced at corners for added strength. The blades shall be airfoil shaped double skin construction with 14 gauge equivalent thickness. Blade action shall be parallel. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. (Galvanized bearings shall not be acceptable). Blade edge seals shall be silicone rubber and galvanized steel mechanically locked into blade edge (adhesive or clip fastened seals not acceptable) and shall withstand a minimum of 450 degrees F. Jamb seals shall be non-corrosive stainless steel flexible compression type to further ensure smoke management.

B. Each combination fire/smoke damper shall be classified for use for fire resistance ratings of less than 3 hours, in accordance with UL standard 555, and shall further be classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems in accordance with the latest version of UL555S, and bear a UL label attesting to the same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes, covering all dampers, required by this specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be leakage Class 1 (4 cfm/sq. ft. at 1" wg and 8 cfm/sq. ft. at 4" wg)

C. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (to open and close) and modulate under HVAC system operating conditions, with pressures of at least 4" wg in the closed position, and up to 4,000 fpm air velocity in the open position.

D. In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 350 degrees F or 450 degrees F depending upon the actuator. Appropriate 120 volt electric two position actuators shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single entity, which meets all applicable UL555 and UL555S qualifications for both dampers and actuators. Manufacturer shall provide factory assembled sleeve of 17" minimum length (contractor to verify requirement). Factory supplied caulked sleeve shall be 20 gauge for dampers through 84" wide and 18 gauge above 84" wide. Damper and actuator assembly shall be factory cycled 10 times to assure operation.

E. Each combination fire/smoke damper shall be equipped with a controlled 7 to 15 second heat-actuated release device. The electric EFL shall close and lock the fire/smoke damper during test, smoke detection, power failure or fire conditions through actuator, closure springs. To prevent duct and HVAC component damage, the damper shall at all times be connected to the actuator for controlled closure in not less than 7 seconds and no more than 15 seconds. Instantaneous damper closure is unacceptable. Damper shall be automatic remote resettable after test, smoke detection of power failure conditions. After exposure to high temperature or fire, the damper must be inspected prior to reset to ensure proper operation. Release temperatures are 165 degrees F.

F. TS150 FireStat: Each combination fire/smoke damper shall be equipped with a UL Classified FireStat equal to Ruskin model TS150. FireStat shall electrically and mechanically lock damper in a closed position when duct temperature exceeds 165 degrees F and still allow appropriate authority to override FireStat and operate damper as may be required for smoke management functions. Damper must be operable while temperature is above 350 degrees F. FireStat

package shall include two damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One switch shall close when damper is fully open; the other switch shall close when damper is fully closed. FireStat and position indicator switches shall be capable of interfacing electrically with smoke detectors, building fire alarm systems, and remote indicating/control stations. FireStat shall be equipped with High Limit Temperature Sensor that meets all requirement of NFPA92A by returning damper to fire protection mode when temperatures reach 350 degrees F, which is the operational limit of the damper and actuator assembly. Dampers shall be Ruskin Model FSD60 with TS150 FireStat package.

G. SP100 Blade Postion Indicator (included as part of TS150 FireStat or supplied separately): Each damper shall be equipped with Ruskin SP100 Switch Package or equivalent. The Switch Package shall include two position indicator switches linked directly to the damper to remotely indicate damper blade position.

H. PFMA: 1-1/2" or 2-1/2" two piece picture frame mounting angles shall be factory supplied and shipped on each damper (requires factory sleeve).

2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at outlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

E. Install volume dampers in each branch duct serving a diffuser or register (supply, return, and exhaust).

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated.

H. Install fire dampers, smoke dampers, and combination fire smoke dampers according to UL listing.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. Connect terminal units to supply ducts with maximum 48-inch lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to ducts directly or with maximum 24-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with liquid adhesive plus tape.

Q. Install duct test holes where required for testing and balancing purposes.

R. Provide turning vanes in non-radius elbows.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Louver face diffusers
2. Linear slot diffusers
3. Linear slot returns
4. Adjustable registers and grilles
5. Fixed face grilles
6. Linear bar grilles

B. Related Sections

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

1.3 SCOPE:

A. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE

RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Louver Face Diffuser

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek Company
   b. Price Industries
   c. Titus
   d. Tuttle & Bailey
   e. Krueger
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, white.
5. Pattern: Adjustable core style.
6. Dampers: Combination damper and grid.
7. Accessories
   a. Square to round neck adaptor
   b. Adjustable pattern vanes

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Slot Diffuser

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek Company
   b. Krueger
   c. Price Industries
   d. Titus
   e. Tuttle & Bailey
2. Devices shall be specifically designed for variable-air-volume flows
3. Material - Shell: Steel, insulated
4. Material - Pattern Controller and Tees: Aluminum
5. Finish - Face and Shell: Baked enamel, black
6. Finish - Pattern Controller: Baked enamel, black
7. Finish - Tees: Baked enamel, white
8. Adjustable flow pattern with opposed blade type damper

2.3 GRILLES & REGISTERS

A. Spiral Duct Supply Air Register

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Titus, Model S300FS
   b. Krueger
   c. Price Industries
   d. Anemostat
   e. Tuttle & Bailey
2. Material: Steel
3. Finish: Baked enamel, color selected by Architect
4. Blade angle: 45°
5. Blade spacing: 3/4"

B. Fixed Face Grille

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek company, Models AC3L and X3H
   b. Krueger
   c. Price Industries
   d. Titus
   e. Tuttle & Bailey
2. Material: Steel
3. Finish: Baked enamel, color selected by Architect
4. Blade angle: 45°
5. Blade spacing: 3/4"

C. Linear Bar Grille

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anemostat Products; a Mestek Company
   b. Krueger
   c. Price Industries
   d. Titus
   e. Tuttle & Bailey
2. Material: Steel
3. Finish: Baked enamel, color selected by Architect

4. Distribution plenum
   a. Internal insulation
   b. Inlet damper
5. Damper Type: Adjustable opposed blade

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level, plumb and in accordance with manufacturer's instructions.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. All air distribution devices shall be diffusers or registers. Use grilles only where noted or where air flow rate is not shown.

E. Where diffusers are connected to ductwork or air valves with flexible duct, the diffuser shall be mounted to ceiling construction.

F. Baffle diffusers in field to achieve proper air distribution in accordance with diffuser location.

G. Verify type of ceiling construction prior to submittal.

H. Install all registers and diffusers after painting is completed.

I. All registers and grilles located in walls shall be color as selected by Architect.

J. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Do not exceed 0.08" H_2O static pressure drop for registers and diffusers. Do not exceed 0.05" H_2O static pressure drop for grilles.

K. Sound criteria shall not exceed NC-30.

L. Paint ductwork visible behind air outlets and inlets matte black.

M. Provide balancing dampers in duct take-off to each diffuser, register and grille regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238126 – VRF SYSTEM

PART 1 - GENERAL

1.1 Work Included:

A. SCOPE:

1. FREDERICK COUNTY SHALL BE RESPONSIBLE FOR THE PURCHASE AND INSTALLATION OF THE MITSUBISHI VRF EQUIPMENT AND ALL ASSOCIATED DUCTWORK, AIR DEVICES, INSULATION, REFRIGERANT LINES, AND CONTROLS, WITH EXCEPTION OF ALL ASSOCIATED EXTERIOR WALL PENETRATIONS AND LOUVERS, WHICH SHALL BE PROVIDED BY GENERAL/MECHANICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OTHER WORK INDICATED ON THE MECHANICAL DRAWINGS AND IN THE MECHANICAL SPECIFICATIONS, INCLUDING ELECTRIC HEATERS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE ELECTRICAL CONNECTIONS TO THE COMPLETE HVAC SYSTEM, INCLUDING THE PORTION THAT FREDERICK COUNTY INSTALLS. THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLUMBING INSTALLATION ASSOCIATED WITH THE COMPLETE HVAC INSTALLATION, INCLUDING CONDENSATE DRAIN PIPING AND PIPING INSULATION FOR THE VRF EQUIPMENT. SPECIFICATIONS REGARDING THE FREDERICK COUNTY INSTALLATION ARE FOR INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE THE INSTALLATION OF THESE SYSTEMS WITH FREDERICK COUNTY'S INSTALLATION CREW.

1.2 Submittals:

A. Submit shop drawings and product data.

B. Submit manufacturer's installation instructions.

C. Submit manufacturer's descriptive literature, operating instructions and maintenance and repair data.

1.3 Warranty:

A. Provide an additional 4 year unconditional parts warranty on compressors.

B. Provide an additional 9 year unconditional parts warranty on the heat exchanger.

PART 2 - PRODUCTS

2.1 Manufacturer:

A. Units shall be products of a manufacturer who provides local service personnel from factory representative, franchised dealer or certified maintenance service shop.

2.2 Variable Refrigerant Flow Zoning (VRFZ) Simultaneous Heat Pump:

A. Quality Assurance.

1. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

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).

4. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

5. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

B. Delivery, Storage and Handling.

1. Unit shall be stored and handled according to the manufacturer's recommendation.

C. Warranty.

1. The units shall be covered by the manufacturer's limited warranty for a period of two (2) years from date of installation.

   a. If the systems are:

      (1) Designed by a certified VRFZ System Designer,
      (2) Installed by a contractor that has successfully completed the factory VRFZ three day service course, (online or teleconference certification is not acceptable), AND
      (3) Verified with a completed commissioning report submitted to and approved by the manufacturer.

      Then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.

   b. The compressor shall have a manufacturer's limited warranty for a period of ten (10) years from date of installation.

   c. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

D. Manufacturer shall have a minimum of ten years of HVAC experience in the U.S. market.

E. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

F. The system shall be installed by a contractor with extensive VRFZ install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

G. General: The system shall consist of the outdoor unit, indoor units, and M-NET DDC (Direct Digital Controls). The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped, wired and run tested at the factory.

1. 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.

2. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

3. Outdoor unit shall have a sound rating no higher than 58 dB(A) individually or 61 dB(A) twinned. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

4. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.

5. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.

6. Outdoor unit shall be able to connect to up to 48 indoor units depending upon model.

7. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

8. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

9. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.

10. The outdoor unit shall have rated performance of heating operation at -13°F ambient temperatures and cooling mode down to 23°F ambient temperatures, without additional low ambient controls. The unit shall maintain 100% heat output at 0°F without a supplemental heat source or a second compressor to boost low ambient heating performance. 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.

11. The outdoor unit shall be capable of operating in cooling mode down to -4°F with optional manufacturer supplied low ambient kit.

12. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.

13. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

14. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.

15. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

16. 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.

17. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

H. Heat Interchanger circuit.

1. The outdoor unit shall contain a heat interchanger circuit for sub-cooling liquid prior to entering the outdoor coil during the heating mode.

2. The interchanger shall be of a copper tube within a tube construction.

3. The interchanger circuit refrigerant flow shall be controlled by an electronic expansion valve.

I. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

J. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

K. Refrigerant

1. R410A refrigerant shall be required for PURY-HP-T/Y(S)KMU-A outdoor unit systems.

2. Polyolester (POE) oil 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.

L. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

M. Basepan Heater:

1. Each outdoor unit module shall be equipped with a basepan heater. Basepan heater shall activate only when compressor is operating in heating mode at an outdoor ambient temperature of 39F or below. If an alternate manufacturer is selected, any additional material, cost, and labor to meet basepan heater condition and performance shall be incurred by the contractor.

N. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.

2. A crankcase heater(s) shall be factory mounted on the compressor(s).

3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.

4. The compressor will be equipped with an internal thermal overload.

5. The compressor shall be mounted to avoid the transmission of vibration.

6. 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.

O. Controls:

1. The outdoor unit shall have the capability of up to 8 levels of demand

control for each refrigerant system.

P. Electrical:

1. The outdoor unit electrical power shall be 460 volts, 3-phase, 60 hertz.

2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 414-506 volts.

3. The outdoor unit shall be controlled by integral microprocessors.

4. 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.

Q. Branch Circuit (BC) Controllers:

1. General:

a. The BC (Branch Circuit) Controllers 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 with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.

b. The BC (Branch Circuit) Controllers shall be specifically used with R410A systems. These units 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. The BC Controller shall 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. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity. The BC Controller shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. BC Unit Cabinet:

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.

3. Refrigerant

a. R410A refrigerant shall be required.

4. Refrigerant Branches

a. All BC Controller refrigerant pipe connections shall be brazed or flared.

5. Refrigerant valves:

a. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.

b. Each branch shall have multiple two-position valves to control refrigerant flow.

c. 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.

d. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

6. Future Use

a. Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.

7. Integral Drain Pan:

    a. An Integral resin drain pan and drain shall be provided

8. Electrical:

    a. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz.

    b. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).

    c. The BC Controller shall be controlled by integral microprocessor.

    d. 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.

R. Wall Mounted Indoor Unit

1. The wall-mounted indoor unit section shall have a modulating linear expansion device and a flat front. The unit shall be used with the VRFZ outdoor unit and BC Controller. The unit shall support individual control using DDC controllers.

2. 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, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

3. Unit Cabinet:

    a. All casings, regardless of model size, shall have the same white finish

    b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.

c. There shall be a separate back plate which secures the unit firmly to the wall.

4. Fan:

a. The indoor fan shall be an assembly with one or two line-flow fan(s) 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. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).

d. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

5. Filter:

a. Return air shall be filtered by means of an easily removable, washable filter.

6. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

b. The tubing shall have inner grooves for high efficiency heat exchange.

c. All tube joints shall be brazed with phos-copper or silver alloy.

d. The coils shall be pressure tested at the factory.

e. A condensate pan and drain shall be provided under the coil.

f. Both refrigerant lines to the PKFY indoor units shall be insulated in accordance with the installation manual.

7. 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)

8. Controls:

a. This unit shall use controls provided by VRFZ manufacturer to perform functions necessary to operate the system. Please refer to below for details on controllers and other control options.

b. The unit shall be able to control external backup heat.

c. The unit shall have a factory built in receiver for wireless remote control

d. 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.

e. 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.

f. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

g. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

S. 4-Way Ceiling-Recessed Cassette with Grille Indoor Unit

1. The 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.

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.

   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 consist of three (3) speeds, 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 auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

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.

b. The tubing shall have inner grooves for high efficiency heat exchange.

c. All tube joints shall be brazed with phos-copper or silver alloy.

d. The coils shall be pressure tested at the factory.

e. A condensate pan and drain shall be provided under the coil.

f. 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.

g. Both refrigerant lines to the PLFY indoor units shall be insulated in accordance with the installation manual.

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. This unit shall use controls provided by VRFZ Manufacturer to perform functions necessary to operate the system.

b. 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.

c. 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.

d. Indoor unit shall include no less than four (4) digital inputs capable

of being used for customizable control strategies.

e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

T. Ceiling-Concealed Ducted Indoor Unit

1. The unit shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The unit shall be used with the VRFZ outdoor unit and BC Controller. The unit shall support individual control using DDC controllers. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. 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, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

3. Unit Cabinet:

a. The unit shall be, ceiling-concealed, ducted.

b. The cabinet panel shall have provisions for a field installed filtered outside air intake.

4. Fan:

a. Unit shall feature external static pressure settings from 0.14 to 0.60 in. WG.

b. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.

c. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

d. The indoor fan shall consist of three (3) speeds, High, Mid, and

Low plus the Auto-Fan function

e. The indoor unit shall have a ducted air outlet system and ducted return air system.

5. Filter:

a. Return air shall be filtered by means of a standard factory installed return air filter.

6. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

b. The tubing shall have inner grooves for high efficiency heat exchange.

c. All tube joints shall be brazed with phos-copper or silver alloy.

d. The coils shall be pressure tested at the factory.

e. A condensate pan and drain shall be provided under the coil.

f. The condensate shall be gravity drained from the fan coil.

g. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.

7. 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).

8. Controls:

a. This unit shall use controls provided by VRFZ Manufacturer to perform functions necessary to operate the system. Please refer

below for details on controllers and other control options.

b. 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.

c. 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.

d. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

U. Controls:

1. General:

a. The Controls Network (CN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® interface.
b. The BACnet® interface, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address

2. Electrical Characteristics:

a. The CMCN shall operate at 24VDC. Controller power and communications shall be via a common non-polar communications bus.
b. The CMCN shall be capable of supporting integration with

Building Management Systems (BMS). The **interface** shall provide, as a minimum, the following functionality for each fan coil unit:

(1) On/Off
(2) Setpoint (both heating & cooling)
(a) Mode of operation
(3) Fan Speed
(4) Indoor temperature
(5) Local prohibit (on/off)
(6) Local prohibit (mode)
(7) Local prohibit (setpoint)
(8) Thermostat off
(9) Filter sign
(10) Thermo “on/off” state
(11) Model size
(12) Alarm state
(13) Error code

c. Wiring:

(1) Control wiring shall be installed in a system daisy chain configuration from indoor unit to ME remote controller 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.
(2) Control wiring for schedule timers, system controllers, and centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to system controllers, to the power supply.
(3) 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.
(4) Control wiring for the Deluxe MA, Simple MA, and Wireless MA remote controllers shall be from the remote controller to the first associated indoor unit

then to the remaining associated indoor units in a daisy chain configuration.

(5) The centralized controller shall be capable of being networked with other centralized controllers for centralized control.

(6) Wiring type:

(a) Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire (as required), as defined by the Design Tool AutoCAD output.

(b) Network wiring shall be CAT-5e with RJ-45 connection.

d. Controls Network.

(1) The Controls Network (CMCN) consists of remote controllers, schedule timers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The Controls Network shall support operation monitoring, scheduling, error email distribution, personal 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 CN System Configuration.

e. CMCN: Remote Controllers.

(1) The Simple MA Remote Controller (PAC-YT53CRAU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Remote Controller shall be compact in size, approximately 3” x 5” and have limited user functionality. The Remote Controller supports temperature display selection of Fahrenheit or Celsius. The Remote Controller shall allow the user to change on/off, mode (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, and fan speed setting and airflow direction. The Remote Controller shall be able to limit the set temperature range

from the Backlit Simple MA. The Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Remote Controller shall display a four-digit error code in the event of system abnormality/error.

(2) Room temperature shall be sensed at each fan coil unit by a plain wall-mount sensor. No display or setpoint adjustment shall be used at the sensor.

f. Centralized Controller (Web Enabled)

(1) The Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple outdoor units with the use of three (3) expansion controllers. The Centralized Controller shall be approximately 11-5/32" x 7-55/64" x 2-17/32" in size and shall be powered with an integrated 100-240 VAC power supply. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. When being used alone without the expansion controllers, the Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Centralized Controller shall include on/off, operation mode selection (cool, heat, auto), dry, setback and fan), temperature setting, fan speed setting, and airflow direction setting. Since the controller provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection,

temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

(2) All Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three expansion controllers for display of up to two hundred (200) indoor units on the main interface.

(3) The Centralized Controller shall be capable of performing initial settings via the high-resolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.

(4) Standard software functions shall be available so that the building manager can securely log into each central controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available but are not included. The Tenant Billing function shall require Integrated System software in conjunction with the Centralized Controllers.

g. Expansion Controller

(1) The Expansion Controller shall serve as a standalone centralized controller or as an expansion module to the A Centralized Controller for the purpose of adding up to 50 indoor units to either the main touch screen interface of the central controller. Up to three (3) expansion controllers can be connected to the central controller via a local IP network (and their IP addresses assigned on the central controller) to the central controller to allow for up to two hundred (200) indoor units to be monitored and controlled from the central controller interface.

(2) The expansion controllers have all of the same capabilities to monitor and control their associated

indoor units as the features specified above. Even when connected to the central controller and configured to display their units on the main controller, the individual indoor units connected to the expansion controller can still be monitored and controlled from the interface. The last command entered will take precedence, whether at the wall controller, the expansion controller or the Centralized Controller.

V. 100% Dedicated Outside Air Heat Pump

1. The reheat DOAS shall be used specifically with the VRFZ outdoor unit using VRF components. The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

2. Outdoor unit shall have a sound rating no higher than 60 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

3. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.

4. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

5. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

6. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.

7. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, 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.

8. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.

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.

10. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend "no or reduced heating" periods shall not be allowed.

11. Unit Cabinet:

    a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models).

12. Fan:

    a. Each outdoor unit module shall be furnished with one or two direct drive, variable speed propeller type fan(s). The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 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 fan motors shall be mounted for quiet operation.
    d. All fans shall be provided with a raised guard to prevent contact with moving parts.
    e. The outdoor unit shall have vertical discharge airflow.

13. Refrigerant:

    a. R410A refrigerant shall be used for the systems.

14. Coil:

a. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
b. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
c. The coil shall be protected with an integral metal guard.
d. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
e. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

15. Compressor:

a. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.
b. A crankcase heater(s) shall be factory mounted on the compressor(s).
c. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 18% of rated capacity.
d. The compressor will be equipped with an internal thermal overload.
e. The compressor shall be mounted to avoid the transmission of vibration.

16. Electrical

a. The outdoor unit electrical power shall be 460 volts, 3-phase, 60 hertz.

b. The outdoor unit shall be capable of satisfactory operation within voltage limits of 414-506 volts.

c. The outdoor unit shall be controlled by integral microprocessors.

d. 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.

17. Branch Circuit Controllers for DOASHP Systems

a. General:

(1) The BC (Branch Circuit) Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall 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. The DOAS BC Controller shall be connected to only one indoor unit, the DOAS indoor unit.

b. BC Unit Cabinet:

(1) The casing shall be fabricated of galvanized steel.
(2) Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
(3) The unit shall house two tube-in-tube heat exchangers.

c. Refrigerant

(1) R410A refrigerant shall be required.

d. Refrigerant valves:

(1) The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH. Branches may be twinned to allow more than 54,000 BTUH.
(2) Each branch shall have multiple two-position valves to control refrigerant flow.
(3) Service shut-off valves shall be field-provided/installed for each branch.
(4) Linear electronic expansion valves shall be used to control the variable refrigerant flow.

e. Integral Drain Pan:

(1) An integral condensate pan and drain shall be provided.

f. Electrical:

(1) The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
(2) The BC Controller shall be controlled by integral microprocessors.
(3) The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

18. 100% Dedicated Outside Air Ducted Indoor Unit (With Reheat):

a. General:

(1) The unit shall be a ducted indoor fan coil that mounts where needed with a fixed rear return and a horizontal discharge supply, primary and reheat coil, and three modulating linear expansion devices. The unit shall be used with the VRF outdoor unit and BC Controller to create a DOAS. The unit shall support individual control using DDC controllers. The unit shall feature external static pressure settings up 0.96 in. WG, depending on voltage.

b. Indoor Unit:

(1) The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, primary cooling coil, reheat coil, temperature and humidity sensors, 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, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

c. Unit Cabinet:

(1) The cabinet shall be ducted on both the supply and return.
(2) The cabinet panel shall have provisions for a field installed filtered outside air intake.

d. Fan:

(1) The indoor unit fan shall be an assembly with two Sirocco fan(s) direct driven by a single motor.
(2) The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
(3) The indoor unit shall have a ducted air outlet system and ducted return air system.

e. Filter:

(1) Outside air shall be filtered by a field-supplied filter. Unit shall have sufficient external static pressure to operate with a MERV-13 filter installed.

f. Coil:

(1) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
(2) The tubing shall have inner grooves for high efficiency heat exchange.
(3) All tube joints shall be brazed with phos-copper or silver alloy.
(4) The coils shall be pressure tested at the factory.
(5) A condensate pan and drain shall be provided under the coil.
(6) A condensate lift mechanism shall be factory installed capable of providing up to 21-11/16” of lift.
(7) All refrigerant lines to the PEFY indoor units shall be insulated.

g. Electrical:

(1) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

h. Controls:

(1) This unit shall use controls provided by VRFZ manufacturer to perform functions necessary to operate the system.

W. Energy Recovery Ventilator (Static Plate with By-Pass)

1. The fresh air ventilation system(s) shall utilize the static plate heat exchanger with outside air bypass damper and energy recovery ventilation. These units shall be selected in accordance with the building ventilation requirements.

2. The ERV shall be equipped with a data network control and will be directly connectable to the Data communication control network and will be able to be electronically interlocked with indoor units.

3. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the UL label.

4. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

5. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 1060 and bear the ARI Certification label.

6. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

7. The installation of all units, duct work, all interconnecting control and power wiring, commissioning and testing shall be carried out by licensed installers in accord with all Codes and requirements.

8. Unit shall be stored and handled according to the manufacturer's recommendations.

9. The unit will be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

10. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

11. The Energy Transfer Core shall have an additional nine (9) year warranty against defects in material or workmanship. The total warranty period shall be ten (10) years from date of installation.

12. The ERV unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, control circuit board and blowers with motors, filters, and insulated foam air guides. Each unit will have an automatic by-pass damper system for economic operation under certain conditions. The unit shall have factory installed control board with functions for local, remote, and optional control modes.

13. Unit Cabinet:

    a. The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached

14. Blowers:

    a. The unit shall be furnished with two (2) or four (4) direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow.

    b. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings.

    c. The blowers and motors shall be mounted for quiet operation.

15. Heat Exchanger

    a. The heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery from the

exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.

b. The element shall have protective filters installed at both the supply and exhaust sides with an access cover to allow easy maintenance.

16. Bypass Damper

a. The ERV shall have an automatic supply side by-pass damper to allow inbound ventilation air to by-pass the energy transfer core when outside weather conditions warrant.

b. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to an mechanical damper flap to allow fresh air to bypass the element.

c. Supply and return air thermistor shall control the damper and may be interlocked with a LCD remote controller.

17. Filter

a. The ERV shall be equipped with factory installed air filters located at each intake face (both supply and exhaust sides) of the core to clean the air and prevent clogging.

18. Mounting

a. Mounting of the ERV shall be as indicated in the plans and drawings. The ERV shall not require and condensate pan or receptacle nor condensate drain or piping. Mounting may be horizontal or vertical and the unit may be inverted as required by ductwork connection.

19. Electrical

a. The units will require a 208-230Volt, 1 Phase, 60Hz power supply.

20. Control

a. A 30vdc fuzzy logic signal generated by a control System via a 2 conductor non polar shielded, jacketed control wire to a remote

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 EXECUTION OF THE WORK

A. The scope of work shown on the drawings and in these specifications, Division 26, 27 and 28 are all a part of this contract and shall be included in the base bid unless otherwise noted.

B. These Specifications call out certain duties of the Electrical Contractor and/or Subcontractors. They are not intended as a material list of items required by the Contract.

C. These divisions of the Specifications cover the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades.

D. Provide all items and work indicated on the Drawings and all items and work called for in the Specifications in accordance with the conditions of Contract (Division 1 General Requirements Documents). This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to verify the systems are fully operable.

E. Comply with all provisions of the Contract Documents including Division 1, General Conditions, and Supplementary General Conditions of the Specifications.

F. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these Specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.

G. Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid. Install and coordinate the electrical work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer. All changes required in the work of the Contractor caused by neglect shall be corrected at the expense of the Contractor.

H. It is the intent of the drawings and specifications to provide a complete workable system ready for the Owner's operation. These specifications are equipment and performance specifications. Items described or called out in the specification but not shown on the drawings are considered to be part of the project. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform to the intent are to be considered a part of the contract. Installation of the equipment shall be in accordance with the N.E.C., manufacturer recommendation, and industry standards.

I. All material furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the Underwriters Laboratory, Inc label provided a standard has been established for the material in question.

J. All products and materials to be new, clean, free of defects and free of damage and corrosion.

K. No exclusion from, or limitation in, the symbolism used on the Drawings for electrical work or the languages used in the Specifications for electrical work shall be interpreted as a reason for omitting accessories necessary to complete any required system or item of equipment.

L. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted.

1.2 COORDINATION OF THE WORK

A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.

B. Carefully check space requirements with other trades and the physical confines of the area to ensure that all material can be installed in the spaces allotted thereto including finished suspended ceilings. Make modifications thereto as required and approved.

C. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.

D. Wherever work interconnects with work of other trades, coordinate with other trades to ensure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

E. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate, project and schedule work with other trades in accordance with the construction sequence.

F. The locations of lighting fixtures, outlets, panels and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the work, or for other legitimate causes.

G. Exercise particular caution with reference to the location of panels, outlets, switches, etc., and have precise and definite locations approved by the Engineer before proceeding with the installation.

H. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and shall receive approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.

I. Obtain from the Engineer in the field the location of such outlets or equipment not definitively located on the Drawings.

J. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuit numbers on the finished record tracing and on panel directory card. Where circuiting is not indicated, the Electrical Contractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.

K. The Drawings generally do not indicate the exact number wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC.

L. Adjust locations of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to installation.

1. Right of way: lines which pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
2. Make offsets, transitions and changes in direction in raceways and as required to maintain proper head room in pitch of sloping lines whether or not indicated on the Drawings.

M. Whenever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.

N. Contractor shall furnish services of experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.

1.3 PROGRESS OF WORK

A. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Engineer.

B. Delivery of Materials: Deliver materials (except bulk materials) in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.

C. Storage of Materials, Equipment and Fixtures: Store materials suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage in dry, heated spaces.

1.5 EQUIPMENT ACCESSORIES

A. Establish sizes and location of the various concrete bases required. Coordinate with General Contractor and provide all necessary anchor bolts together with templates for holding these bolts in position.

B. Provide supports, hangers and auxiliary structural members required for support of the work.

C. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls and floors and elsewhere as will be required for the proper protection of each raceway and passing through building surfaces.

D. Wall mounted equipment, total weight of 100 pounds or less, may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment, with total weight of more than 100 pounds, shall be mounted on adequately free standing sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Globe-Strutt and Unistrut, may be used for mounting arrays of equipment.

1.6 CUTTING, PATCHING, ETC.

A. The work shall be carefully laid out in advance. Where Cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.

B. The Contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless he first obtains permission from the Engineer. If permission is granted, the Contractor shall perform this work in a manner approved by the Engineer.

C. Where conduits, outlet, junction, or pullboxes are mounted on a painted surface, or a surface to be painted, they shall be painted to match the surface. Whenever support channels are cut, the bare metal shall be cold galvanized.

D. Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. The trade requiring them to properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.

1.7 MOUNTING HEIGHTS

A. Unless otherwise noted, mounting heights for equipment and wiring devices shall be as shown as noted on the drawings.

1.8 CLEANING UP

A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc. resulting from the installation of work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Architect's instructions, which shall be promptly carried out.

B. Contractor shall clean all fixtures and equipment at the completion of the project.

C. All panelboards, wireway, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment at the completion of the project. Equipment shall be opened for observation by the Architect as required.

1.9 WATERPROOFING

A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings. Perform work so as to maintain any warranties currently in effect.

B. If this Contractor penetrates any walls or surfaces after they have been waterproofed, this Contractor shall restore the waterproof integrity of that surface at the expense of this Contractor and as directed by the Architect.

1.10 PRODUCTS

A. If products and materials are specified or indicated on the drawings for a specific item or system, use those products or materials. Where noted in other sections of this specification, equipment has been specified for a specific performance and substitutions are not permitted. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.

1.11 OMISSIONS FROM THE DRAWINGS

A. Should a Bidder find discrepancies in or omissions from the drawings or specifications or be in doubt as to their meaning, he shall notify the Architect before submitting his proposal. The Architect will in turn, send written instructions to all Bidders. Neither the Architect nor the Owner will be responsible for oral instructions. If the Contractor fails to comply with this requirement, he shall accept the Engineer's interpretations as to the intended meaning of the drawings and specifications.

1.12 EXECUTION

A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Architect before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.

B. Use mechanics skilled in their trade for all work.

C. Clean all items before and after installation. Clean up all debris.

D. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

E. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.

F. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

1.13 VERIFICATION OF ELECTRICAL REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS

A. Prior to the installation of wiring systems for any equipment furnished by others, this contractor shall verify that the electrical requirements of the equipment match those shown on the electrical drawings by examining the approved shop drawings of that equipment. Any discrepancies shall be immediately reported to the engineer.

B. If the contractor fails to comply with this requirement, he shall be responsible for any additional costs incurred at no additional cost to the Owner.

1.14 PROTECTION OF BUILDING FIRE/SMOKE BARRIERS

A. Passages of conduit through fire barriers and/or smoke barriers shall be protected as follows:

1. The space between the penetrating item and the fire barrier and/or smoke barrier shall be filled with a material capable of maintaining the fire/smoke resistance of the barrier or be protected by an approved device designed for the specific purpose.
2. Where the penetrating item uses a sleeve to penetrate the fire and/or smoke barrier the sleeve shall be solidly set in the fire/smoke barrier and the space between the item and the sleeve shall be filled as described above.
3. Fire barriers shall include 1-hour, 2-hour, and 3-hour rated floors and walls. Refer to architectural plans for location of fire barriers and smoke barriers and provide protection required to maintain ratings in accordance with all codes.
4. Approved fill material for fire barriers shall be packed mineral wool, with ASTME-136 rating and 3M Fire Barrier caulk. Coordinate sealing of all openings with requirements of Division 7 of this specification.
5. Perform work in accordance with the appropriate UL Ratings.
6. Product Data: Provide manufacturer's specifications, recommendations and installation instructions for each application.

1.15 CODES AND FEES

A. General: Comply with Codes in accordance with the Contract Documents.

B. The electrical installation shall be in compliance with the requirements of OSHA, NEC and the rules, regulations and requirements of the power company supplying power to the building.

C. The electrical installation shall comply fully with all township, county and state laws, ordinances and regulations applicable with electrical installations.

D. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE and UL.

E. Should any change in Drawings or Specifications be required to comply with governmental regulations, the Contractor shall notify Architects prior to execution of the work. The work shall be carried out according to the requirements of such code in accordance with the instruction of the Architect and at no additional cost to the Owner.

F. The local fees and permits and services of inspection authorities shall be obtained and paid for by the Contractor. The Contractor shall cooperate fully with local utility companies with respect to their services.

G. Certificate of Inspection and approval shall be procured and paid for by this Contractor from an approved certified inspection agency.

1.16 GUARANTEE

A. General: Provide a Guarantee in accordance with the Contract Documents.

B. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one (1) year from date of final acceptance by the Owner, except that where guarantees or warranties for longer terms are specified herein, such longer term to apply. Within 24 hours after notification, correct any deficiencies which occur during the guarantee period at no

additional cost to Owner, all to the satisfaction of the Owner and Architect. Obtain similar guarantees from subcontractors, manufacturers, suppliers and subtrade specialists.

1.17 DISPOSAL

A. All electrical items not designated by the Owner for his use to be properly disposed of according to local, state and Federal regulations.

B. Items containing polychlorinated biphenyl (PCB) to be removed, transported and disposed of according to Federal Toxic Substances Control Act (TSCA). Contractor to submit certification that these items have been properly disposed.

1.18 EXCAVATION AND TRENCHING

A. Provide excavation for the work. Excavate all material encountered to the depths indicated on the Drawings or required. Remove from the site excavated materials not required or suitable for backfill. Provide grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Remove any water accumulating therein. Provide sheeting and shoring as may be necessary for the protection of the work and for the safety of personnel.

B. Provide trenches of widths necessary for the proper execution of the work. Grade bottom of the trenches accurately to provide uniform bearing and support the work on undisturbed soil at every point along its entire length. Where rock excavations are required, excavate rock to a minimum overdepth of 4 inches below the trench depths indicated on the Drawings or required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly machine tamped to a compaction level as specified by the Engineer. Whenever unstable soil incapable of properly supporting the work is encountered in the bottom of the trench as determined by the Engineer, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel or other suitable material.

1.19 BACKFILLING OF TRENCHES

A. Do not backfill trenches until all required tests have been performed and the installation observed by the Engineer. Comply with the requirements of other sections of these Specifications. Deposit backfill in 6 inch layers and thoroughly and carefully tamp until for work has a cover of not less than 1 foot. Backfill and tamp remainder of trench at 12 inch intervals until complete. Uniformly grade the finished surface. Install a 6 inch marking ribbon 12 inches below finished grade.

END OF SECTION 260500

SECTION 260508 - TESTING, ACCEPTANCES, AND CERTIFICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Complete testing of equipment and systems shall be provided throughout in accordance with the Contract Documents.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents comply with the latest applicable provisions and the latest recommendations of the following:

1. Industry standards shall apply except as otherwise specified.

1.3 Applicable codes, standards and references

A. All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

1. National Electrical Manufacturer's Association – NEMA
2. American National Standards Institute – ANSI
3. Institute of Electrical and Electronic Engineers – IEEE
4. National Electrical Code – NEC
5. National Fire Protection Association – NFPA
6. American Society for Testing and Materials – ASTM
7. Insulated Power Cable Engineers Association – IPCEA
8. Association of Edison Illuminating Companies – AEIC
9. Occupational Safety and Health Administration – OSHA
10. State and local codes and ordinances
11. Applicable Independent Testing Associations Specifications

B. All inspections and tests shall utilize the following references:

1. Project design specifications
2. Project design drawings
3. Manufacturer's instruction manuals applicable to each particular apparatus.

1.4 SUBMITTALS

A. The test report shall include the following:

1. Summary of project
2. Description of equipment tested
3. Description of test

4. Test results
5. Conclusions and recommendations
6. Appendix, including appropriate test forms
7. List of test equipment used and calibration date
8. Conditions for future access to secured computer database of all Test Data.

B. Furnish three copies of the completed report to the project engineer no later than 30 days after completion of the project, unless directed otherwise.

1.5 SAFETY AND PRECAUTIONS

A. Safety practices shall include, but are not limited to, the following requirements:

1. Occupational Safety and Health Act of 1970 – OSHA 29CFR 1910.269
2. National Fire Protection Association – NFPA 70E
3. Applicable state and local safety operating procedures.

B. All tests shall be performed with apparatus de-energized except where otherwise specified.

C. The engineering service testing group's lead test engineer for the project shall be a designated safety representative and shall be present on the project and supervise testing operations and safety requirements.

D. Power circuits shall have conductors shorted to ground by a hotline grounded device approved for the purpose in accordance with the appropriate test procedures.

E. In all cases, work shall not proceed until the safety representative has determined that it is safe to do so.

F. The engineering service testing group shall have available sufficient protective barriers and warning signs, where necessary, to conduct specified tests safely.

G. The owner's safety procedures shall be reviewed and understood by the engineering service testing group personnel.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide all labor, premium labor and materials required by shop and field testing as specified in the Contract Documents and as required by the authorities having jurisdiction.

2.2 SYSTEMS

A. The following systems are to be tested, inspected and certified.

1. Wire and Cable (600 Volts and Below)

a. Inspect all splices and terminations and make mechanically and electrically tight during a fifteen (15) day period immediately prior to final acceptance of the work.
b. Insulation System – To ensure integrity of the cable insulation system after shipping, site storage, and pulling through conduit an insulation resistance test will reveal insulation deformities and moisture in the cable that otherwise might cause an untimely premature cable failure possibly damaging equipment or personnel. Perform the following on all customer power cables to and from main switchboard. This would include cables from utility transformer to MSB and cables from MSB to all secondary switchboards or distribution panels.
c. Visually inspect visible portion of cables for observable defects.
d. Ensure all solid-state devices are disconnected from the system prior to meggering. Typically but not all-inclusive would be Meters, trip units with voltage sensing, and SPD units.
e. Isolate cables by opening breakers. Meggering thru equipment like motors or transformers will produce erroneous readings.
f. Perform insulation-resistance tests on each line and load cable, phase-to-phase, phase-to-ground, phase-to-neutral and neutral-to-ground in each conduit. Megger at 1000 VDC for 600 volt cable and 500 VDC for 300 volt cable for one minute.
g. Insulation resistance shall be above 100 ohms and preferably above one megohm.
h. Ensure cable termination connections are tight after testing.

2. Motors
   a. Test all motors under load and verify that motor rotation is correct.
3. Fire Alarm Systems
   a. All wiring must be inspected and tested to insure that there are not grounds, opens or shorts. The minimum allowable resistance between any two conductors or between conductors and ground is ten (10) megohms as measured with a 500 volt meager after all conduit, conductors, detector bases, etc., have been installed, but before the detector devices are plugged into the bases or end-of-line devices installed.
   b. The Contractor must perform all electrical and mechanical tests required by the equipment manufacturer's form. All test and report costs must be in the Contract price. A checkout report is to be prepared by the technician and submitted in triplicate, one copy of which will be registered with the equipment manufacturer. The report is to include, but not be limited to:
      1) A complete list of equipment installed and wired.
      2) Indication that all equipment is properly installed and functions and conforms to these specifications.
      3) Tests of individual zones as applicable.
      4) Serial numbers, locations by zone and model number for each installed detector.
      5) Voltage (sensitivity) settings for each ionization detector as measured in place.
      6) Response time on detectors.
      7) Contractor shall submit a certified report indicating the following:
         a) Operating all manual stations and all detectors that can be reset.
         b) Verifying line supervision of each initiating and indicating circuit.
         c) Verifying the operation of each initiating circuit.
         d) Verifying the operation of all indicating devices.
         e) Verifying the operation of all alarm- initiated functions.
         f) Verifying full operation of the F.C.I.P.
4. Switchboard Acceptance Testing For Main Switchboard(s)

a. Examine the Main switchboard(s), including breakers, and accessories for:
   1) Doors, panels, and sections for alignment, dents, scratches, fit, and missing hardware
   2) Shipped loose and shipped short components.
   3) Shipping damage
   4) Loose or obviously damaged components.
   5) Proper identification.
   6) Physical damage from installation.
   7) If the unit was placed in temporary storage, verify and record that proper procedures were observed. Remove temporary heater wiring and shipping braces.

b. Inspect
   1) Shipping Splits to insure that all bus connections were properly connected and all control wiring splits have been properly terminated.
   2) Inspect all grounding connections for cleanliness and alignment.
   3) Main Bonding Jumper for proper size and termination (Refer to NEC Article 250, Section 250-102, Equipment Bonding Jumpers).
   4) Insulators for evidence of physical damage or contaminated surfaces.
   5) Surge Arrester and/or Surge Suppression size, type, installation and connection to determine if they are in accordance with the drawings (Refer to NEC Article 280)
   6) Control power & instrument transformers, if applicable.
   7) Wiring for damaged insulation, broken leads, and tightness of connections, proper crimping, and overall general condition.

c. Verify Structure, Grounding, Cables and Bus Assembly
   1) Anchorage (per local codes, wind and seismic considerations).
   2) Required area clearances, correct alignment and cleanliness.
   3) Verify the grounding electrode conductor is properly sized (in accordance with NEC Article 250, Table 250-66) and terminated.
   4) The proper grounding of instruments, panels and connections (Refer to NEC Article 250, Part J, Sections 250-170 through 250-178).
   5) That conductors are properly identified (as applicable).
   6) Cable termination tightness.
   7) That all cables have been properly installed, routed and supported and are clear of energized parts.
   8) That conduits and conduit bushings are correctly installed.
   9) Tightness of accessible bolted electrical connections, especially shipping splits, by calibrated torque-wrench method in accordance with manufacturers published data.

d. Verify Control and Instrumentation
   1) That all VT and CT ratios properly correspond to drawings and that polarity is correct.
   2) That shorting screws and bars are removed from CT's and terminal blocks as required.
   3) That primary and secondary fuse ratings or circuit breakers match drawings.
   4) Meter scaling and type match drawings.

e. Set Meter, Relay, and Breaker Trip settings
   1) The meter, protective relay, breaker settings (and PFC choices) must be supplied from a Power System Study performed by the engineer service group prior to commissioning.

2) Calculations and settings are to take into account coordination and protection that might be non-intuitive. i.e., a 5000 amp breaker may be set to a 3000 amp trip point to match a utility primary fuse. While this may not seem right at first, tripping the main first rather than a normally smaller utility transformer may avoid blowing a primary utility fuse, and avoid the resulting single phasing and the downtime of waiting for the utility response. It would be far simpler and faster to reset main and reenergize quickly, not to mention the loss of equipment from single phasing.
3) Set meter, relay, & breaker trip setting per above study.

f. Ductor Testing
1) Inspect shipping splits for mechanical connection assuring adequate surface contact.
2) Ground bonding & shipping splits shall be tested with ductor tester (Digital low ohm resistance meter) to insure connection is a low resistance connection. Test from one fixed bus to adjacent fixed bus through the shipping split connector to measure both connection points.
3) Microhm values shall not vary more than 50% from other phase readings and meet the manufactures published data based on bus size, ampacities and material.

g. Test of the Phase Loss and Undervoltage Relay
1) Test the phase loss relay, either separate or integral to the multimeter, to activate contact.
2) Test the undervoltage relay, either separate or integral to the multimeter, to activate contact.
3) If contact is hooked to the Capacitor trip & Shunt trip combo on main breaker, insure main breaker trips.
4) If contact reports to energy management system, insure energy management system receives loss of phase/voltage signal.

h. Ground Fault Testing
1) Inspect switchboard main bonding jumper for proper size and termination on source side of neutral disconnect link.
2) Inspect Grounding electrode conductor to assure proper size and secure termination to ground bus.
3) Inspect switchboard neutral bus downstream of the neutral disconnect link to verify the absence of ground connections.
4) Set Ground fault setting per calculations in E above.
5) Verify Ground Fault System Performance for correct response of the circuit-interrupting device by secondary (or primary if local inspector requires) ground sensor current injection. Record ground fault pickup current. Verify breaker trips and indicator works.
6) Verify Ground fault does not pick-up at 90% of pickup setting.
7) Record settings, results, and any other notations on the Low Voltage Breaker data form.

PART 3 - EXECUTION

3.1 GENERAL

A. Notify the Architect seven (7) days prior to the testing dates. If the Architect so elects not to witness a specific test a statement of certification must be forwarded to the Architect for his approval.

B. Conduct tests at a time agreeable to the Architect. Provide premium labor as necessary.

C. Products which are found defective or do not pass such tests shall be removed and replaced at the Contractor's expense. Tests shall be repeated.

D. Conduct all test required by the authorities having jurisdiction.

3.2 RESTORATION OF EQUIPMENT AND REPORTS

A. Before Energizing

1. Remove and account for all test equipment, jumper wires, and tools used during testing.
2. Remove and account for safety grounds and tools.
3. Replace all barriers and covers, close all doors, and secure all latches.
4. Remove safety locks and tags.
5. Ensure all adjustable meters, relays and trip devices are properly set in accordance with the coordination study.
6. Apply testing label to equipment

B. Note corrective actions taken, deficiencies, recommendations and any general comments.

C. Finish recording data on test forms, completely filling in the blanks. Enter into electronic database as required in section 1.04.E

D. Turn in 3 copies of report to engineer for approval.

3.3 FOLLOW UP TESTING

A. Included in above cost as part of original project.

B. One month prior to the expiration of the factory warranty schedule & perform a thermal scan of all breaker to cable, breaker, bus connections, cable to panel chassis. Scope is to include main transformer connections, main switchboard, all secondary switchboards, transformers, and panels. Tests are to be done with building normal loaded for 2 hours, not with partial or unloaded condition.

C. Thermal scan temperatures shall be evaluated as follows (based on comparable size or adjacent phases and loaded breakers, bus connections, and terminations)

1. 1-3 degrees C rise, Investigate as to the cause of temp rise.
2. 4 – 15 degree C rise, Repair as soon as possible.
3. 16 or higher degree C rise, Repair immediately.

D. Ensure that all bus and breaker to cable connections are tight.

E. Note corrective actions taken, deficiencies, recommendations and any general comments.

F. Finish recording data on test forms, completely filling in the blanks.

G. Turn in 3 copies of report to engineer for approval.

END OF SECTION 260508

SECTION 260519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. General: Provide 600 volt wire and cable in accordance with the Contract Documents.

1.3 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Underwriters Laboratory Standard No. UL 467
   a. ASTM
   b. IPECA
2. Terminal Blocks
   a. UL-1059

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

A. General

1. Provide wire with a minimum insulating rating of 600 volts, except for wire used in 50 volts or below applications for control of signal systems use 300 volt minimum or 600 volt where permitted to be incorporated with other wiring systems.

B. Conductor

1. Electrical grade, annealed copper fabricated in accordance with ASTM standards. Minimum size number 12 for branch circuits; number 14 for control wiring.
2. The conductors shown on the drawings are copper, except as noted otherwise.

C. Stranding and Number of Conductors

1. Number 12 and number 10 solid.
2. Cables larger than number 10, stranded in accordance with ASTM Class B stranding designations.

3. Control wires stranded in accordance with ASTM Class B stranding designations.
4. Cables, multi-conductor unless otherwise noted for low tension systems.

D. Insulation

1. Type THWN/THHN insulation suitable for use in wet locations up to 75 degrees Centigrade. Use for lighting, receptacle and motor circuits and for panel and equipment feeders.

E. Color Coding

1. Provide consistent color coding of all feeders, sub feeders, motor circuits and the likes as follows:

120/208 Volts Code
Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

2. Color code wiring for control systems installed in conjunction with mechanical and/or miscellaneous equipment in accordance with the wiring diagrams furnished with the equipment. Factory color code wire number 2 and smaller. Wire number 1 and larger may be color coded by color taping of the entire length of the exposed ends.

2.2 CONNECTORS

A. Make connections, splices, taps and joints with solderless devices, mechanically and electrically secure. Protect exposed wires and connecting devices with electrical tape or insulation to provide not less than that of the conductor.

B. Branch Circuit wires (Number 10 and smaller): Use any of the following types of terminals and connecting devices:

1. Hand Applied
   a. Coiled tapered, spring wound devices with a conducting corrosion-resistant coating over the spring steel and a plastic cover and skirt providing full insulation for splice and wired ends. Screw connector on by hand.
2. Tool Applied
   a. Steel cap, with conduction and corrosion resistant metallic plating, open at both ends, fitted around the twisted ends of the wire and compressed or crimped by means of a special die designed for the purpose. Specifically fitted plastic or rubber insulating cover wrap over each connector.

2.3 ELECTRICAL TAPE

A. Specifically designed for use as insulating tape.

2.4 LUBRICANT

A. Use lubricant only where the possibility of damage to conductors exists. Use only a lubricant approved by the cable manufacturer and one which is inert to cable and raceways.

PART 3 - EXECUTION

3.1 WIRE AND CABLE

A. Provide a complete system of conductors in raceway system. Mount wiring through a specified raceway, regardless of voltage application.

B. Drawings do not indicate size of branch circuit wiring. For branch circuits whose length from panel to furthest outlet exceeds 100 feet for 120-volt circuits, use number 10 or larger.

C. Do not install wire in incomplete conduit runs nor until after the concrete work and plastering is completed and moisture is swabbed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily accessible pull, junction, or outlet.

D. Provide cable supports for all vertical risers where required by code.

E. Use terminating fittings, connectors, etc., of a type suitable for the specified cable furnished. Make bends in cable at termination prior to installing compression device. Make fittings tight.

F. Extend wire sizing for the entire length of a circuit, feeder, etc. unless specifically noted otherwise.

G. Provide a separate neutral conductor for each branch circuit. In the event a common neutral conductor is used, such as in furniture systems, the circuit breaker in the panelboard must be common trip for each phase that uses one neutral conductor.

END OF SECTION 260519

SECTION 260526 – 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 1 Specification Section, apply to this Section.

1.2 SUMMARY

A. General: Provide a low impedance grounding system in accordance with the Contract Documents.

1.3 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Underwriters Laboratory Standard No. UL 467
2. ANSI C-1 1978

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish and install an electrical grounding system as indicated on the construction documents and as specified herein.

B. Grounding systems shall be installed in accordance with the requirements of the local authorities, NEC Section 250, and subject to the approval of the Architect.

C. All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.

2.2 GROUNDING SYSTEMS

A. The system neutral shall be grounded at the service entrance only, and kept isolated from grounding systems throughout the building.

B. Each system of continuous metallic piping and ductwork shall be grounded in accordance with the requirements of the NEC Section 250.

C. Metal conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated coupling, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.

D. All conduits, metal raceways, boxes, cabinets, etc., installed by this Contractor and all motors and equipment connected shall be properly bonded and grounded.

E. In all feeders and branch circuits install a green colored ground wire to each panel, cabinet, receptacle, motor or a piece of control equipment.

F. The green ground wires shall be extended and connected to the ground bus in the panels or equipment enclosure. Neutral wiring system shall not be used for this purpose. Green ground wire shall be connected to all junction or pull boxes through which they pass and to all cabinet and panel enclosures.

G. This ground wire shall be run in same conduit as phase and neutral wires feeding equipment, motor or receptacles and conduit size shall be increased if necessary. This conductor shall be installed whether or not shown on the drawings and shall be sized in accordance with NEC but shall not be smaller than #12 AWG. Motors shall be grounded by a grounding terminal in their connection box. Tie all ground wires together in panels and connect to ground bus in panel cabinet.

H. All electrical equipment including lighting fixtures shall be grounded in the same manner as motors. All equipment shall be solidly grounded to the green covered wire and this Contractor shall furnish grounding lugs as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Grounding connections and splices shall be brazed molded exothermic welded, bolted clamp terminal or pressure-connector type. Bolted connections and pressure-connectors shall be used for connections to removable equipment. Brazed connections shall be made where noted on drawings.

END OF SECTION 260526

SECTION 260529 – HANGERS AND SUPPORTS 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 1 Specification Section, apply to this Section.

1.2 SUMMARY

A. Equipment shall be installed on hangers and supports as specified in this section of the specifications.

1.3 SUPPORTS

A. Support work in accordance with the best industry practice and the following.

B. Include supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets.

C. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free-standing position.

D. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

E. Nothing, (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways, or cables for support, except that threaded hub type fittings having a gross volume not in excess of 100 cubic inches may be supported from heavy wall conduit, where the conduit in turn is securely supported from the structure within five inches of the fitting on two opposite sides.

F. Nothing shall rest on, or depend for support on, suspended ceilings media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling).

G. Provide required supports and hangers for conduit, equipment, etc., so that loading will not exceed allowable loadings of structure.

1.4 FASTENINGS

A. Fasten electric work to building structure in accordance with the best industry practice and the following:

B. As a minimum procedure, where weight applied to the attachment points is 100 pounds or less, fasten to building elements of:

1. Wood – with wood screws.
2. Concrete and solid masonry – with bolts and expansion shields.
3. Hollow Construction – with toggle bolts.
4. Solid metal – with machine screws in tapped holes or with welded studs.
5. Steel decking or subfloor – with fastenings as specified below for applied weights in excess of 100 pounds.

C. As a minimum procedure, where weight applied to the attachment points exceeds 100 pounds, but is 300 pounds or less, conform to the following:

1. At concrete slabs utilize 24" x 24" x 1/2" steel fishplates on top with through bolts. Fishplate assemblies shall be chased in and grouted flush with the tob of slab screen line, where no fill is to be applied.
2. At steel decking or subfloor for all fastenings, utilize through bolts or threaded rods. The tops of bolts or rods shall be set at least one inch below the top fill screen line and grouted in. Suitable washers shall be used under bolt heads or nuts. In cases where the decking or subfloor manufacturer produces specialty hangers to work with his decking or subfloor such hangers shall be utilized.

D. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.

E. For items which are shown as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to the building structural elements.

END OF SECTION 260529

SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide raceways in accordance with the Contract Documents.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
   1. Electrical Metallic Tubing – EMT
      a. UL Standard UL-797
      b. ANSI C80-3
      c. Federal Specification WW-C-563
   2. Flexible Metal Conduit – FMC
      a. UL Standard UL-1
   3. LiquidTight Flexible Metal Conduit – LFMC
      a. UL Standard UL-360
   4. Rigid Non-Metallic Conduit – RNC
      a. UL Standard UL-651
      b. ANSI Standard C33.91
      c. Federal Specifications GSA-FSS and W-C1094-A
   5. Metal Clad Cable – MC
      a. UL Standard 1581
      b. Federal Spec J-C-30B

PART 2 - PRODUCTS

2.1 RACEWAY TYPES

A. Electric Metallic Tubing – EMT

   1. Continuous, seamless tubing galvanized or sheradized on the exterior coated on the interior with a smooth hard finish of lacquer, varnish or enamel.
   2. All couplings, connectors, etc., used in conjunction with this raceway which are 2 inch in size and smaller shall be watertight compression type. EMT fittings shall be malleable iron zinc coated. With conduits of 2-1/2 inch in size and larger, set screw type couplings are permitted.

B. Flexible Metal Conduit – FMC

   1. Single strip, continuous, flexible interlocked double-wrapped steel, galvanized inside and outside forming smooth internal wiring channel.
   2. Maximum length: 6 feet.

3. Each section of raceway must contain a bonding wire bonded at each end and sized as required. Provide connectors with insulating bushings.

C. LiquidTight Flexible Metal Conduit – LFMC

1. Same as flexible steel conduit except with tough, inert watertight plastic outer jacket.
2. Cast malleable iron body and gland nut cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and busing and nylon insulated throat.

D. Metal Clad Cable – MC

Non Health Care

1. Type MC cable shall be armored galvanized steel sheath cable with copper conductors and THHN 90 º insulation. Furnish with insulated grounding conductor.

E. Rigid Non-Metallic Conduit – RNC

1. Composed of polyvinyl chloride suitable for 90º C.
2. Raceway, fittings and cement must be produced by the same manufacturer who must have had a minimum of ten (10) years experience in manufacturing the products.
3. Materials must have a tensile strength of 7,000 – 7,200 psi and compressive strength of 9,000 psi.
4. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer. Install expansion fittings per NEC.

2.2 OUTLET, JUNCTION AND PULLBOXES

A. Provide zinc-coated or cadmium-plated sheet steel outlet boxes not less than 4 inches octagonal or square, unless otherwise noted. Equip fixture outlet boxes with 3/8 inch no-bolt fixture studs where required. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide Series "GW" (Steel City) tile box, or as accepted, or a 4 inch square box with tile ring in masonry walls which will not be plastered or furred. Where drywall material is utilized, provide plaster ring. Provide outlet boxes of the type and size suitable for the specific application. Where outlet boxes contain two or more 277 volt devices, or where devices occur of different applied voltages, or where normal and emergency devices occur in same box, provide suitable barrier.

B. Construct junction or pullboxes not over 150 cubic inches in size as standard outlet boxes, and those over 150 cubic inches the same as "cabinets" with screw covers of the same gauge metal.

C. Plug any open knockouts not utilized.

D. Provide surface mounted outlet and junction boxes in indoor locations where exposed to moisture and outdoor locations of cast metal with threaded hubs.

PART 3 - EXECUTION

3.1 APPLICATION OF RACEWAYS

A. The following applications must be adhered to except as otherwise required by Code. Raceway not conforming to this listing must be removed by this Contractor and replaced with the specified material at this Contractor's expense.

B. Raceway Types Application

Electrical Metallic Tubing EMT	Use in every instance except where another material is specified.
Flexible Metal Conduit – FMC	Use in dry areas for connections to lighting fixtures in hung ceilings, connections to equipment installed in removable panels of hung ceilings at all transformer or equipment raceway connections where sound and vibration isolation is required.
LiquidTight Flexible Metal Conduit - LFMC	Use in areas subject to moisture where flexible steel is unacceptable at connections to all motors, and all raised floor areas.
Rigid Non-Metallic Conduit – RNC	1. Schedule 40 – Where raceways are in slab in below grade levels, for raceway duct banks. 2. Schedule 80 – For underground raceways outside of the building which are not encased in concrete
Metal-Clad Cable - MC	Use for branch circuit wiring above suspended ceilings or in metal stud walls. Cable shall not be run exposed. Home run wiring from panelboard to first outlet box shall be installed in conduit. MC cable not permitted for fire alarm wiring systems or emergency lighting.

3.2 RACEWAY SYSTEMS IN GENERAL

A. Provide raceways for all wiring systems unless noted otherwise. Where non-metallic raceways are utilized, provide sizes as required with the grounding conductor considered as an insulated additional conductor. Minimum size 3/4 inch for home runs and 1 inch minimum for power distribution. Wiring of each type and system must be installed in separate raceways.

B. Install capped bushings on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Raceways installed below or in floor slabs must extend a minimum of 4 inches above the finished slab to the first connector. Lay out the work in advance to avoid excessive concentrations or multiple raceway runs.

C. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install 1 inch or larger raceways in or through structural members (beams, slabs, etc.) only when and in the manner accepted by the Architect. Draw up couplings and fittings full and tight. Protect threads from corrosion with one coat zinc chromate after installation.

D. Above Grade – Defined as the area above finished grade for a building exterior and above top surface of any slabs (or other concrete work) on grade for a building interior. Above-grade raceways to comply with the following:

1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of 6 inches from flues, steam pipes, or other heated lines. Provide flashing and counter-flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run embedded raceways in a direct line and, where possible, with long sweep bends and offsets. Provide sleeves in forms for new concrete walls, floor slabs and partitions for passage of raceways. Waterproof sleeved raceways where required.
2. Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction.
3. Provide drag wire in spare or empty raceways. Tag both ends of wire denoting opposite and termination location with black India ink on flameproof linen tag.

E. Below Grade: Defined as the area below finished grade for a building exterior and below or within the bottom floor slab for a building interior. Below grade raceways to comply with the following.

1. Project below-grade raceways 2 inches minimum above floor or equipment foundation. Install exterior underground conduits 24 inches minimum below finished grade. Do not penetrate waterproof membranes unless proper seal is provided.

F. No raceway may be installed in a concrete slab except with the permission of the Structural Engineer and with the written consent of the Owner. Conduits embedded in structural concrete slabs shall have the following minimum thickness and shall conform to the following:

Raceway Sizes	Minimum Thickness of Concrete Slab
3/4"	4 - 1/2"
1"	5"

1. Unless specifically approved in writing, raceways 1-1/4 inch size and larger shall not be installed in structural concrete slabs.
2. In no case will installation of raceways be permitted to interfere with the proper placement of principal reinforcement.
3. Raceways in structural slabs shall be placed between the upper and the lower layers of reinforcing steel. This will require careful bending of conduits.
4. Raceways embedded in concrete slabs shall be spaced not less than 8 inches on centers and as widely spaced as possible where they converge at panels or junction boxes.
5. Raceways running parallel to slab supports, such as beams, columns and structural walls, shall be installed not less than 12 inches from such supporting elements.
6. To prevent displacement during concrete pour of lift slab, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured with suitable adhesives.

G. Rigid non-metallic conduit installations shall conform to the following:

1. All joints are to be made by the solvent cementing method using the material recommended by the raceway manufacturer. Fittings, cement and conduit shall be supplied by the same manufacturer.
2. Raceway cutoffs shall be square and made by handsaw or other approved means which does not deform the conduit. Raceway shall be reamed prior to solvent cementing to couplings, adapters, or fittings.
3. Electrical devices which are served by PVC raceways to be grounded by means of ground wire pulled in the raceway.
4. Male box adapters shall be used for all box or raceway fittings to terminate plastic raceways.
5. Where separable terminations are required, they shall be made using PVC threaded adapters with locknuts or bushings. If such terminations must be watertight, "O" rings shall be installed.
6. Bends shall be made by methods that do not deform or damage the conduit. The radii of field bends shall not be less than those established by the NEC.
7. Raceway expansion fittings shall be provided in accordance with NEC. The position of the expansion fitting shall be adjusted proportional to the temperature at installation.
8. Raceway supports shall be installed in such a manner to allow the PVC conduit to slide through the supports as the temperature changes.
9. Rigid non-metallic conduit is not permitted to be installed within the building.

H. Raceways in hung ceilings shall be run on and secured to slab or primary structural members of ceiling, not to lathing channels or T-bars or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Install as high as possible, but not less than, 1-0" above hung ceilings.

I. Exposed raceways shall be run parallel or at right angles with building lines. Secure raceway clamps or supports to masonry materials by toggle bolts, expansion bolts, or steel inserts. Install raceway on steel construction with approved clamps which do not depend on friction or set-screw pressure alone.

J. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. This shall be done with ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt or similar material. This assembly may be pulled in together with, but ahead of the cable being installed. All empty raceways shall be similarly cleaned. Clear any raceway which rejects ball mandrel.

K. Support less than 2 inch trade size, vertically run, raceways at intervals no greater than eight feet. Support such raceways, 2 inch trade size or larger, at intervals no greater than 10 feet.

L. Support less than 1 inch trade size horizontally run, raceways at intervals not greater than 7 feet. Support such raceways, 1 inch trade size or larger, at intervals no greater than 10 feet.

3.3 OUTLET, JUNCTION, AND PULLBOXES

A. Provide outlet, junction, and pullboxes as indicated on the Drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables. J-boxes and pullboxes shall be sized per NEC minimum.

B. The exact location of outlets and equipment is governed by structural conditions and obstructions or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels equipment, etc., with Architect.

C. Back-to-back outlets in the same wall or "thru-wall" type boxes are not permitted. Provide 12 inch (minimum) spacing for outlets shown on opposite sides of a common wall to minimize sound transmission.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for electrical raceways
2. Identification of power and control cables
3. Identification for branch circuit and feeder conductors
4. Underground-line warning tape
5. Warning labels and signs per N.E.C.
6. Instruction signs
7. Identification labels for distribution equipment, junction boxes, cabinets and miscellaneous equipment.

1.3 SUBMITTALS

A. Product Data: Furnish type of material to be supplied for each electrical identification product indicated.

1.4 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Comply with ANSI A13.1
2. Comply with NFPA 70
3. Comply with 29 CFR 1910.144 and 29 CFR 1910.145
4. Comply with ANSI Z535.4 for safety signs and labels

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors and features with requirements in the Contract Documents, shop drawings, manufacturer's wiring diagrams and operation and manual and with those required by codes and standards.

PART 2 - PRODUCTS

2.1 POWER RACEWAY AND METAL CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Raceway Colors for Circuits at 600 V or Less

1. Black letters on an orange field.
2. Fire Alarm Circuits: Red letters on natural field.
3. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, Bright-Colored, Continuous-Printed, Polyethylene Tape

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 90A: Identify with orange self-adhesive vinyl label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands.

1. Fire Alarm System: Red
2. Fire-Suppression Supervisory and Control System: Red and Yellow
3. Combined Fire Alarm and Security System: Red and Blue
4. Security System: Blue and Yellow
5. Mechanical and Electrical Supervisory System: Green and Blue
6. Telecommunication System: Green and Yellow
7. Control Wiring: Green and Red

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors,

at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
   1. Power

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

   1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
      a. Colors for 208/120-V Circuits
         1) Phase A: Black
         2) Phase B: Red
         3) Phase C: Blue
         4) Neutral: White
         5) Ground: Green
      b. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install marking tape at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    a. Power transfer switches.
    b. Controls with external control power connections.

H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions
    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide five lines of text.
        1) First Line: 1/2-inch letters on the first line stating equipment name.
        2) Second Line (if applicable): 3/8-inch letters stating the existing equipment name in parentheses ( ).
        3) Third Line: 3/8-inch letters stating voltage/phase.
        4) Fourth Line: 3/8-inch letters stating the breaker number, panel name and room number/name (Owner's room number) from which the equipment is fed.
        5) Fifth Line: 3/8-inch letters stating function and/or equipment which it controls.
2. Equipment to be Labeled
    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Enclosed switches.

END OF SECTION 260553

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide panelboards in accordance with the Contract Documents.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Panelboards
    a. UL Standards #67.
    b. UL Standard 50 Cabinet and Boxes
    c. Federal Standard W-P-115.
    d. NEMA Standard PB-1
    e. Circuit Breakers – Type 1, Class 1.

B. Submittals will be furnished. Submittals failing to meet the following criteria will be returned without a review or acceptance.

C. With each panelboard drawing the following is required:

1. Show main devices and lug sizes; branch circuit device sizes and arrangement; bus ampacities; withstandability and short circuit rating; dimensions and construction; gutter and backbox dimensions; nameplate and legend; protective coating; and all pertinent details of panel, enclosure, cover, and method of securing cover and lock.

1.3 QUALITY ASSURANCE

A. Each panelboard as a complete and finished product shall receive a single integrated equipment rating by the manufacturer. The integrated equipment short circuit wiring shall certify that all equipment is capable of withstanding the thermal and magnetic stress of a fault equal to the value specified on the Drawings. Such rating shall be established by actual tests by the manufacturer on similar equipment. This certification shall be permanently affixed to each panelboard. Test data shall be submitted to the Engineer at time of submission of Acceptance Drawings.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

1. Square D
2. Eaton

3. General Electric
4. Siemens

2.2 PANELBOARDS IN GENERAL

A. Provide panelboards consisting of an assembly of branch circuit switching and protective devices (circuit breakers, switch and fuse units, or combination thereof) mounted inside a dead front enclosure. Provide the number and size of these branch circuit devices as indicated by the circuiting, on the drawings, and in the schedules.

B. Provide the following modifications and additional equipment as shown on the Drawings:

1. Main circuit breakers.

C. Interiors

1. Rigid removable assembly of copper bus bars and interchangeable bolted branch circuit devices.
2. Bus bars drilled to permit branch circuit devices of all sizes and number of poles to be interchangeable and installed in any spare space of sufficient size, without disturbing adjacent units; without removing main bus or branch circuit connectors and without machining, drilling, or tapping in the field.
3. Arrange bus in sequence or distributed phasing so that multipole circuit breaker can replace any group of single circuit breakers of the same size.
4. Provide neutral bus in each panelboard.
5. Provide ground bus in each panelboard.

D. Enclosure

1. Code gauge steel box galvanized.
2. Provide a bolt-on ground connector to inside of enclosure.
3. Flush mounted in finished areas and where indicated. Surface mount elsewhere.

E. Front

1. Doors must be provided on all lighting and power distribution panels. On switch and fuse panelboards, doors for overcurrent devices are not to be provided.
2. Heavy code gauge steel as required to maintain panel face flat.
3. Hold front closed with trim clamps.
4. Factory finished in medium gray enamel or two coats of air-drying lacquer over a rust inhibitor.
5. Provide directory for total number of poles.
6. Provide approved lock. All panels keyed alike. Furnish 4 sets of matching keys to the Owner.
7. Welded angle rest at the bottom of the door to facilitate cover installation.
8. Doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to lock and catch.
9. Door-in-door construction.

F. Terminal lugs

1. Bolted type, labeled for either copper or aluminum conductors.
2. Locate main lugs properly at top or bottom, depending where main feeder enters.

G. Electrical Ratings

1. Panelboards are to be rated 120/208 volts 3 phase, 4 wire, full neutral with ampacities as indicated on the Drawings (unless otherwise noted).
2. Short circuit withstand ratings shall be as indicated on the Drawings. Panelboards shall be fully rated. Series rated not acceptable.
3. Where indicated, provide panelboards having a "service entrance" Type UL label with neutrals factory bonded to frame or enclosure.

H. Circuit Breaker Devices

1. Plastic molded case. Completely sealed enclosure. Toggle type operating handle. Trip ampere rating and ON/OFF indication clearly visible.
2. Thermal-magnetic trip-free, trip-indicating, quick-make, quick-break, with inverse time delay characteristics. Single-handle and common tripping multipole breakers.
3. Silver alloy contacts with auxiliary arc-quenching devices.
4. Panelboard must be of the type which will accept the field installation of shunt trip devices of 60 amperes or less on the branch devices.
5. Interrupting capacities shall be as indicated on the Drawings. In general, 120/208 volt devices shall be not less than (10,000 AIC).
6. Bolted type terminals UL listed for either aluminum or copper 75 degrees C cables.
7. Locate next to each breaker or space unit an individual number.
8. Panelboard shall accept circuit breakers from 15 ampere to 100 ampere.

2.3 DISTRIBUTION PANELBOARDS

A. Distribution panelboards with bolt-on devices shall have interrupting ratings as specified herein or indicated on the drawings. Panelboards shall be fully rated.

B. Where indicated, provide circuit breakers UL listed for application at 80% of their continuous ampere rating in their intended enclosure.

C. Trip Units for Molded Case Circuit Breakers – 1200 A and Below

1. Protective devices shall be molded case circuit breakers with inverse time and instantaneous tipping characteristics and shall be Square D or approved equal.
2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
3. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.

4. Circuit breakers 225-ampere frame and below shall have thermal-magnetic trip units and inverse time-current characteristics.
5. Circuit breakers 250-ampere through 1200-ampere frame shall have microprocessor-based rms sensing trip units.
6. Ground fault protection shall be provided where indicated.

D. Enclosure

1. Enclosures shall be at lest 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electrical Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
2. Enclosures shall be provided with blank ends.

E. Nameplates

1. Provide an engraved nameplate for each panel section.

2.4 SURGE PROTECTIVE DEVICES

A. Provide surge protective devices as specified in Section 264313.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount panel 4 feet to panel center but with maximum height of 6 feet 6 inches to handle of topmost switching device.

B. Mount surface type panels a minimum of 1 inch off wall on channels.

C. Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty-Raps", or approved equal at minimum 4 inch intervals.

D. Plug all knockouts removed and not utilized.

3.2 TOUCH UP AND CLEANING

A. Vacuum all backboxes clean of debris after installation and prior to final payment.

B. Touch up scratch marks, etc. with matching paint.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. General: Provide wiring devices in accordance with the Contract Documents.

1.2 QUALITY ASSURANCE

A. Switches and receptacles shall be of the same manufacturer.

B. Reference shall be made to the drawings for additional wiring devices not noted in this section of the specifications.

C. Manufacturer shall have a minimum of ten (10) years experience in the manufacture of wiring devices similar to those specified on this project.

D. Manufacturer shall have ISO-9002 certification.

1.3 STANDARDS

A. Switches: Federal Specifications WS-896E.

B. Receptacles: Federal Specification WC596-D, NEMA WD-1, and UL 498.

C. Ground Fault Circuit Interrupter Receptacles: UL 943 Class A.

1.4 SUBMITTALS

A. Manufacturer's product data sheets.

1.5 COLORS

A. Device and coverplate colors shall be white unless otherwise indicated on the architectural drawings:

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Catalog numbers shall not be used to determine colors of devices and coverplates. Catalog numbers are used to establish minimum acceptable standard.

B. Switches and Receptacles: Hubbell or equal.

2.2 SWITCHES

A. General

1. Switches shall be of the type indicated on the Drawings.
2. Switches shall be commercial specification grade, quiet type, 20A, 120/277V, 1 HP rated at 120V, 2HP rated at 240V, back and side wired, silent handle operation.
3. Switch with pilot light shall be specified for applications where the load to be controlled is not in sight. Pilot light shall be long life, neon type and shall be on when the load is on.

B. Lighting Switches
1. Toggle Handle Type
   a. Single pole: Hubbell: HBL1221
   b. 3-way: Hubbell: HBL1223
   c. 4-way: Hubbell: HBL1224

2.3 RECEPTACLES

A. General

1. Receptacles shall be of the type indicated on the Drawings.
2. Receptacles shall be heavy duty 20A specification grade, 125V, grounding type, back and side wired.

B. Receptacles

1. Duplex, 20A: Hubbell: HBL5362

C. Ground Fault Circuit Interrupter Receptacles

1. Duplex, 20A: Hubbell: Commercial GF20L

D. Special purpose receptacles: Rating as indicated on the Drawings.

E. Weatherproof Receptacles and Cover

1. Exterior weatherproof outlet shall be Hubbell. While in use, cast aluminum, 1 gang vertical, GFCI receptacle Catalog #WP26M or approved equal.

2.4 WALL DIMMERS

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations".

PART 3 - EXECUTION

3.1 GENERAL

A. General

1. The exact location of wiring devices shall be determined by location of equipment and as detailed on the Architectural Drawings. Prior to installation the Owner has the right to have the devices relocated 25'-0" at no cost.
2. Devices mounted above counters shall be 2 inches above the top of the backsplash to the bottom of the coverplate.

B. Switches

1. Mount switches vertically with the ON position on top.
2. Mount switches on the strike side of doors, unless otherwise detailed on the drawings.

C. Receptacles

1. Mount receptacles vertically with the grounding pin on top.
2. Provide conventional style duplex receptacles in mechanical and electrical equipment rooms and janitor closets. Provide designer style type duplex receptacles to match rocker handle type lighting switches in all other areas.

D. Coverplates

1. Install device plates in full contact with wall surface. Plates shall not project out from the wall.
2. Coverplates for multiple gang wall dimmers shall be continuous flush type tailored to match wall dimmer physical dimensions.

3.2 IDENTIFICATION

A. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

END OF SECTION 262726

SECTION 262813 – FUSES

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide fuses in accordance with the Contract Documents.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. UL Standard #198

1.3 SUBMITTALS

A. Provide a complete set of shop drawings to include let-thru curves for each type of fuse.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mains, Feeders and Branch Circuits

1. General
   a. All fuses shall be labeled as UL Class L or UL Class R, current limiting and rated for up to 200,000 amperes. Time delay Class R fuses shall be so labeled.
2. Branch Circuits
   a. Feeding circuit breaker panels shall be UL Class RK1.
   b. Feeding motor circuits shall be UL Class RK1 labeled as Time-delay.
3. All fuses shall be so selected as to provide a selectivity coordinated system.
4. All fuses shall be of the same manufacturer.
5. All fuses to be of the Class R type.

B. Spares: Upon completion of the building, the contractor shall provide the Owner with spare fuses as indicated below:

1. 10 percent (minimum of 3) of each type and rating of installed fuses shall be supplied as spares.

C. Manufacturers

1. Littelfuse, Bussmann, Gould-Shawmut.

PART 3 - EXECUTION

3.1 GENERAL

A. Fuses shall not be installed until equipment is ready to be energized.

B. All fuses shall be provided by the Electrical Contractor.

END OF SECTION 262813

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide enclosed fusible disconnect switches in accordance with the Contract Documents.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. UL Standards #98
2. NEMA KS-1

1.3 SUBMITTALS

A. Submit manufacturers' data for all disconnect switches.

PART 2 - PRODUCTS

2.1 ENCLOSED SWITCHES

A. Enclosed switches shall be fused heavy-duty, single-throw knife switch with quick-make, quick-break mechanism, capable of full load operations. Meet NEMA and U.S. Government specifications for Class A switches. Install fused switches unless otherwise noted.

B. Provide with contact arc-quenching devices, such as magnetic blowouts or snuffing plates. Provide self-aligning switchblades with silver alloy contact areas and designed so that arcing upon making and breaking does not occur on the final contact surfaces. Provide with high-pressure, spring-loaded contact. Mount switch parts on high-grade insulating base. All safety switches shall be fused unless otherwise noted.

C. Enclosure: NEMA 1 with hinged door, and defeatable interlock when switch is in "On" position and can be positively padlocked in "on" and "off" positions. Utilize NEMA 3R (rain-tight) enclosure for exterior installations. NEMA 3R enclosures must be galvanized.

D. Size fusing and number of poles as shown or as required. Where fused, the devices must be provided with UL listed rejection feature to reject all but Class R fuses. Provide horsepower rated switch to match motor load if no size is shown. Use 3 pole plus solid neutral switches on four wire circuits and 3 pole switches on all other circuits unless otherwise noted.

E. Lugs must be UL listed for aluminum and/or copper conductors and be front removable.

F. Manufacturer to be the same as that for transformers, switchgear, etc.

G. Acceptable manufacturers: Square D, Cutler-Hammer, General Electric or Siemens.

2.2 TOGGLE TYPE MANUAL CONTROL SWITCHES

A. Provide switches that operate at their full rating with fluorescent, tungsten, and resistance loads – and at 80% of their rated capacity with motor loads.

B. Switches to be heavy duty and have:

1. Arc-resisting bodies.
2. Slow make-and-break mechanisms.
3. Silver alloy contact buttons.
4. Side or back wiring with up to No. 10 AWG solid conductors.

C. Acceptable manufacturers: Square D Class 2510, 11, or 12; General Electric Type RB and Siemens Class MMS with enclosure.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, MENA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250 Type A.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Each piece of equipment utilizing multi-phase power shall be supplied with a safety-type disconnect switch.

B. Each piece of equipment utilizing single-phase power and protected at over 30 amperes shall be supplied with a safety-type disconnect switch.

C. Motor disconnects other than mentioned above may utilize a toggle type manual control switch properly sized and rated for the equipment it disconnects.

D. Factory installed fused disconnect switches may be used to satisfy the above requirements with the Architect’s prior approval.

3.2 MOUNTING

A. Switches or circuit breakers less than 100 pounds may be mounted on the wall. Equipment over 100 pounds shall be mounted on a rack that extends from floor to ceiling. Do not mount switches or circuit breakers to equipment housing.

END OF SECTION 262816

SECTION 264313 - SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchboards and panelboards. Refer to related sections for surge requirements in:

1.2 RELATED SECTIONS

A. Section 262416 – Panelboards

1.3 REFERENCES

A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.4 SUBMITTALS – For Review/Approval

A. The following information shall be submitted to the Engineer:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).
2. For sidemount mounting applications (SPD mounted external to electrical assembly), electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.

B. Where applicable the following additional information shall be submitted to the engineer:

1. Descriptive bulletins
2. Product sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Section 1.4 and shall incorporate all changes made during the manufacturing process.

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D

B. Eaton

C. GE

D. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

5. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

MODES	208Y/120
L-N; L-G; N-G	700
L-L	1200

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
   a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
      1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
      2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
      3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.
   b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
   c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
6. Overcurrent Protection
   a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
8. Safety Requirements
   a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
   b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
   c. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

2.3 SYSTEM APPLICATION

A. The SPD applications covered under this section include distribution and branch panel locations and switchboard assemblies as indicated on drawings. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
CATEGORY	Application	Per Phase	Per Mode
C	Service Entrance Locations (Main Entrance)	250 kA	125 kA
A	Branch Locations (Panelboards)	120 kA	60 kA

C. SPD Type - All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.4 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
3. The panelboard shall be capable of re-energizing upon removal of the SPD.
4. The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
5. The SPD where noted on drawings or in schedules shall be included and mounted within the panelboard by the manufacturer of the panelboard.
6. The SPD shall be of the same manufacturer as the panelboard.
7. The complete panelboard including the SPD shall be UL67 listed.

2.5 ENCLOSURES

A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:

1. NEMA 1 – Constructed of a polymer (units integrated within electrical assemblies) or steel (sidemount units only), intended for indoor use to provide a degree of protection to personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects (falling dirt).

PART 3 - EXECUTION

3.1 EXAMINATION

NOT USED

3.2 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.3 INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.4 WARRANTY

A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION 264313

SECTION 265200 - SOLID STATE LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes, but is not necessarily limited to, the furnishing and installation of solid state lighting (SSL) Luminaires (herein referred to as Luminaires) applied to the illumination of interior and exterior spaces. Luminaires shall be listed in accordance with national recognized testing laboratories (NETLs) approved by the United States Department of Labor, Occupational Safety and Health Administration (OSHA).

1.2 DEFINITIONS AND STANDARDS

A. The terms and standards used or referenced herein are defined as follows:

ANSI-C78.377	American National Standard for Electric Lamps – Specifications for the Chromacity of Solid State Lighting (SSL) Products.
ANSI-C82.11	American National Standard for Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts.
ANSI-C82.SSL1	SSL Drivers (in ANSI development)
CALiPER	Commercially Available LED Product Evaluation and Reporting 'A' US DOE program for the testing and monitoring of commercially available LED Luminaires and lights.
CCT	Correlated Color Temperature: Visible light characteristic of comparing a light source to a theoretical, heated black body radiator; measured in Kelvin.
Cd	Candela: Unit of measurement of light intensity.
Chromaticity	The property of color of light.
fc	foot-candle. Unit of illuminance.
IEC-EN-61000-6-3	International Electotechnical Commission – Electromagnetic Compatibility (EMC) Generic Standards – Emission Standard for residential, commercial and light-industrial environments.
IEEE C62.41.1	IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.
IEEE C62.41.2	IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and less) AC Power Circuits.

IES-LM-79-08	Illuminating Engineering Society – Approved Methods: Electrical and Photometric Measurements of Solid-State Lighting Products.
IES-LM-80-08	Illuminating Engineering Society – Approved Methods: Measuring Lumen Maintenance of LED Light Sources.
IES LM-82-12	Illuminating Engineering Society – Approved Methods: Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
IES-TM-21	Method for determining an LED luminaire or integral replacement lamp's expected operating life, based on initial performance data collected per IES-LM-80.
L80	The extrapolated life in hours of the luminaire when the luminous output depreciates 20 percent from initial values.
LED	Light Emitting Diode.
METS	Material Engineering and Testing Services of the Translab.
NEMA	National Electrical Manufacturers Association.
NVLAP	National Voluntary Laboratory Accreditation Program. A program under the US DOE to accredit independent testing laboratories to qualify.
Power Factor	The ratio of the real power component to the total (complex) power component.
Rated power	Power consumption that the luminaire was designed and tested for at ambient temperature.
SPD	Surge Protection Device. A subsystem or component(s) that can protect the unit against short duration voltage and current surges.
SSL	Solid-State Lighting.
THD	Total Harmonic Distortion. The amount of higher frequency power on the power line.

B. Except as herein specified or as indicted on the Drawings, the work of this section shall comply with the following:

1. ANSI-UL Standards
   a. 924 – Emergency Lighting and Power Equipment
   b. C78.377 – Chromacity of Solid State Lighting (SSL) Products
   c. C82.11 – High Frequency Fluorescent Lamp Ballasts
   d. C82.SSL1 – SSL Drivers

2. IEC
   a. EN-61000-6-3 – EMC Emission Standards
3. NFPA
   a. 70-NEC
   b. 101-Life Safety
4. Standards as listed and referenced in this Specification.

C. All LED Luminaires shall have a CRI of at least 80, an estimated life of at least 50,000 hours at 70% lumen maintenance, and shall include a minimum 5-year warranty on the entire luminaire including the driver. The luminaire and LEDs shall have been tested in accordance with LM-79 and LM-80.

1.3 FIXTURE SCHEDULE

A. No substitutions other than the equal manufacturers listed on the light fixture schedule will be accepted, unless otherwise approved in writing by the Engineer. The lighting equipment specified herein has been carefully chosen for its ability to meet luminous performance requirements of this project. Substitutions in all likelihood will be unable to meet all of the same criteria as specified equipment.

B. Once Bids and Shop Drawings are approved, all lighting is to be ordered according to construction schedule and lead times. The Contractor is then to inform the Engineer immediately, in writing, the date when equipment orders are completed and delivery scheduled.

1.4 SUBMITTALS

A. Submit shop drawings and manufacturers' data for the following items in accordance with the conditions of the contract and as specified below.

1. Shop drawings shall be submitted with product datasheets that include the following information:
   a. General device descriptions
   b. Dimensions
   c. Wiring details
   d. Nomenclature
   e. Operating temperature range
   f. System efficacy
   g. Rated life
   h. Rated output
   i. Input wattage
   j. Inrush current
   k. THD
   l. Power factor
   m. Warranty
   n. CCT
   o. The rated life
   p. Lumen output
      This information shall be provided for the actual lumen package and driver combination specified. Provide information regarding the effects of temperature

on the rated life and lumen output. If applicable, the submittal shall also include the US Department of Energy Lighting Facts label.

2. Major luminaires and special luminaires shall show full size cross sections. Indicate finished dimensions, metal thicknesses, and materials.
3. Show mounting details, including hung ceiling construction.
4. Shop drawings shall include a complete listing of all luminaires on a single sheet. This listing shall contain the luminaire type, manufacturer's catalog number, applied voltage, and wattage.
5. Submit manufacturer's fixtures and accessories Shop Drawings and data in booklet form, including rough-in dimensions, instructions for installation and maintenance.

1.5 WARRANTY

A. The manufacturer shall provide a warranty against loss of performance and defects in materials, finishes, and workmanship for the Luminaires and all components for a minimum period of 5 years after acceptance of the Luminaires. Replacement Luminaires shall be provided promptly after receipt of Luminaires that have failed at no cost to the customer. All warranty documentation shall be provided to customer prior to random sample testing.

B. Failure of the LED light source shall be defined as failure or negligible output of 10% or more individual LEDs within the LED array, bar, etc.

1.6 PROTECTION

A. Protect lighting fixtures and work against dirt, water or mechanical damage before, during, and after installation. Damage to fixtures prior to final acceptance shall be repaired or replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND FIXTURES

A. General

1. Provide all lighting fixtures in accordance with Lighting Fixture Schedule and as indicated and required on Drawings.
2. Fixture catalog numbers only indicate type and style. Provide each fixture complete with proper fixture trim, levelers, mounting brackets, flanges, plaster rings, glassware and accessories for complete installation as required for type of ceiling and room finish schedules.
3. All plastic diffusers used in lighting fixtures shall be manufactured of 100 percent virgin acrylic plastic, polycarbonate, or as otherwise noted.
4. Provide gaskets as required to prevent light spill between frames and ceilings.
5. Provide "wet" labels on all fixtures installed outdoors or in moist areas.
6. Provide continuity of ground on all fixtures used as raceways and mounted end to end.
7. All metal parts to be chemically treated with a rust resistant phosphatized solution, internal components and reflecting surfaces to have a factor of minimum 90%.

8. Provide luminaires, completely factory-assembled and wired and equipped with necessary light sources, drivers, wiring, shielding, reflectors, channels, lenses, etc., and deliver to job ready for installation.
9. Luminaire Reflector Care: Luminaires with Alzak reflectors shall be installed with Mylar cover over reflectors. Cover shall be UL listed for temporary lighting. Upon completion of work, remove Mylar cover with white glove and blow clean reflectors.
10. Finish: Porcelain or baked enamel finish matte white on interiors with minimum test reflectance of 90% matte white finish or as specified in visible exterior. Thoroughly clean base metal and bonderize after fabrication.
11. Where utilized as raceway, luminaires shall be suitable for use as raceways. Provide feed through splice boxes where necessary. Wiring shall be rated for 90 degrees Centigrade.

B. Luminaires

1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply). If required, components such as the LED array and driver shall be modular and replaceable without removing the luminaire.
2. Each luminaire shall be rated for a minimum operational life as specified on lighting fixture schedule or per basis of design luminaire, as defined by IES LM-80 and TM-21.
3. Each luminaire shall be designed to operate at an average operating temperature of 25°C.
   a. The typical operating temperature range shall be -10°C to +25°C, unless otherwise specified on lighting fixture schedule and Drawings.
   b. Some parameters and tests (such as IESNA standard LM-80-08) shall be conducted at different ambient temperatures.
4. Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated within the rated temperature range.
5. The individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
6. Each luminaire shall be listed with a nationally recognized testing laboratory (including but not limited to UL, CSA, ETL) under UL 1598 and UL 8750, or an equivalent standard from a recognized testing laboratory.

C. LEDs

1. The light source of the luminaires shall consist of LED arrays or bars. If required, the LED arrays or bars shall be removeable.
2. The LEDs shall be either white or RGB, according to the light fixture schedule and Drawings. For luminaires specified with white light, it is not acceptable to provide RGB LEDs mixed to produce white light.
3. Refer to the light fixture schedule and Drawings for the specified correlated color temperature (CCT) of each luminaire.
4. Individual LEDs shall be binned by manufacturer to comply with ANSI C78.377.
5. The LEDs shall be manufactured by Cree, Philips, Toshiba, Osram, Samsung, or Nichia, unless otherwise noted.

D. Drivers

1. The driver or power supply for the luminaire shall be modular and replaceable.
2. The rated life of the driver shall match the rated life of the LEDs and luminaire.

3. In general, the drive current rating of the driver shall be minimized, while still maintaining the required lumen output, to improve luminaire efficiency and life.
4. The driver shall meet the emission standards of IEC EN-61000-6-3 at a minimum. For healthcare or other applications with EMI sensitive equipment, provide drivers that meet more stringent standards as required.

E. Exit Lighting

1. Exit lighting system shall be as indicated on Drawings.
2. Equipment shall be complete with LED light sources.
3. Where indicated as such, provide battery pack and charger with self-diagnostics for illumination under power failure conditions.
4. Equipment shall meet BOCA, OSHA, NFPA and NEC illumination standards.

F. Emergency Lighting

1. Provide GTD or GTD20A transfer devices suitable for use with solid-state lighting (Bodine or approved equal manufacturer) as indicated on drawings, light fixture schedule, and lighting control schedule.

2.2 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: ½ inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, ½ inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

PART 3 - TECHNICAL REQUIREMENTS

3.1 ELECTRICAL

A. Power Consumption: Maximum power consumption allowed for the luminaire shall be per basis of design light fixture listed on lighting fixture schedule.

B. Operation Voltage

1. The luminaire shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 110 VAC to 277 VAC as specified on the drawings. The fluctuations of line voltage shall have no visible effect on the luminous output.
2. The standard operating voltages are 120 VAC as shown on drawings.

C. Current: The inrush current for the luminaire shall be published on the luminaire data sheet and shall be less than that of the basis of design fixture listed on the light fixture schedule.

D. Power Factor: The luminaire shall have a power factor of 0.90% or greater at all standard operating voltages.

E. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage. The luminaire shall comply with ANSI C82.11, or equivalent ANSI LED Standard C82.SSL1.

F. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.

1. The surge protection which may reside within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 for Location Category A Low. Where failure does not mean a momentary loss of light during the transient event.
2. Surge protection performance shall be tested per the procedures in ANSI/IEEE C62.45 based on ANSI/IEEE C62.41 definitions for standard and optional waveforms for Location Category A-Low

G. Operational Performance: The LED circuitry shall prevent perceptible flicker to the unaided eye over the voltage range specified above.

H. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in IEC EN-61000-6-3 and Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.

I. Dimming: Where dimming is specified on the drawings, the luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output. Dimming shall be controlled by a 0-10V signal, unless otherwise noted or specified.

1. Dimming switches and other control system components shall be compatible with the LED driver type – constant current reduction (CCR) or pulse-width modulation (PWM). The device(s) shall be rated to accommodate full load, as well as inrush current and repetitive peak currents.
2. The luminaire and dimming controls shall produce a smooth change in lumen output, without any visible flicker.
3. The luminaire shall be capable of dimming without any visible change in CCT and color rendition.

J. Multi-Level Control: Where specified on drawings, the luminaire shall be provided with multiple power supplies, multi-level power supply, or other similar means to facilitate multi-level control of luminaire.

K. Temperature Range: The luminaire shall have the capability of operating and maintaining rated lumen output and rated life within the temperature range specified on the lighting fixture schedule and Drawings, or within that of the basis of design luminaire if no temperature range is specifically listed.

L. Lumen Output and Performance

1. The luminaire shall maintain the lumen output specified on the lighting fixture schedule and Drawings, or that of the basis of design luminaire if no minimum lumen output is specifically listed.
2. The lumen output shall be maintained regardless of ambient temperature fluctuations, within the rated temperature range. The luminaire data sheets shall specify any effect or variation on lumen output from temperature.
3. The luminaire shall be capable of continuously monitoring system performance to allow for constant lumen management/compensation, if specified in lighting fixture schedule, Drawings, or basis of design luminaire.
4. The luminaire shall provide a total system efficacy that meets or exceeds that of the basis of design luminaire listed on the light fixture schedule and Drawings.

M. Rated Life: The luminaire shall have a rated life that meets or exceeds that listed on the lighting fixture schedule and Drawings, or that of the basis of design luminaire if no rated life is specifically listed.

3.2 PHOTOMETRIC REQUIREMENTS

A. Light Output

1. The minimum initial lumen output of the luminaire exiting the luminaire in the 0-90 degree zone - as measured by IESNA Standard LM-79-08 shall be as specified in the lighting fixture schedule and Drawings, or that of the basis of design luminaire if no lumen output is specifically listed.
2. The lumen output shall not decrease by more than 30% over the minimum operational life (or L70 shall be at least the minimum number of hours specified).
3. The measurements shall be calibrated to standard photopic calibrations.

B. Light Color/Quality

1. Corrected Color temperature (CCT) range shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
2. The color rendition index (CRI) shall be 80 or greater for interior applications, and 70 or greater for exterior applications.

3.3 THERMAL MANAGEMENT

A. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

1. The LED manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
2. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient.
3. The luminaire shall have an UL IC rating, if applicable.

B. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design.

1. The use of fans or other mechanical devices shall not be allowed.

3.4 PHYSICAL AND MECHANICAL REQUIREMENTS

A. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply for the luminaire shall be integral to the unit, unless otherwise specified.

B. The assembly and manufacturing process for the SSL luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration.

C. The optical assembly of the luminaire shall be constructed so that individual LED images shall not be visible to the occupant.

D. The electronics/power supply enclosure shall be internal to the SSL luminaire and be accessible per UL requirements.

E. The circuit board and power supply shall be contained inside the luminaire.

F. Electrical connections between normal power, driver and LED boards must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation from the room side and all electrical components must to be able to be replaced without removing the fixture from the ceiling.

G. For LED retrofit lamps, the weight of the unit shall be in compliance with weight ratings of the lamp sockets/bases.

3.5 MATERIALS

A. Housings shall be fabricated from material indicated on lighting fixture schedule.

B. If applicable, refractor or lens shall be made from UV inhibited high impact plastic (such as acrylic or polycarbonate) or heat and impact resistant glass.

C. If applicable, polymeric materials of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. The lenses of the luminaire are excluded from this requirement.

3.6 LUMINAIRE IDENTIFICATION

A. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside the each unit and the outside of each packaging box.

B. The following operating characteristics shall be permanently marked inside each unit: rated voltage and rated power in Watts and Volt-Ampere.

3.7 QUALITY ASSURANCE

A. The luminaires shall be manufactured in accordance with a manufacturer quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of the modules built to meet this specification, and a documented process of how problems are to be resolved.

B. QA process and test results documentation shall be kept on file for a minimum period of seven years.

C. LED luminaire designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised, or sold as conforming to this specification.

D. Design Qualification Testing

1. Design Qualification Testing shall be performed by a National Voluntary Laboratory Accreditation Program (NVLAP) testing facility. Such testing may be performed by the manufacturer or an independent testing lab hired by the manufacturer on new luminaire designs, and when a major design change has been implemented on an existing design. A major design change is defined as a design change (electrical or physical) which changes any of the performance characteristics of the luminaire, results in a different circuit configuration for the power supply, or changes the layout of the individual LED's in the module.
2. A quantity of two units for each design shall be submitted for Design Qualification Testing.
3. Product submittals shall be accompanied by product specification sheets or other documentation that includes the designed parameters as detailed in this specification. These parameters include (but not limited to):
4. Maximum power in Watts
5. Maximum Designed Junction Temperature
6. L70 in hours, when extrapolated for the average operating temperature
7. Product submittals shall be accompanied by performance data that is derived in accordance with appropriate IESNA testing standards and tested in a laboratory that is NVLAP accredited for Energy Efficient Lighting Products.
8. Product submittals shall be accompanied by a test report showing surge protection performance as tested per the definitions and procedures in ANSI/IEEE C62.41 1991
9. Thermal testing data and reporting shall be provided based in the sensor input as defined below:
    a. Temperature sensors shall me mounted on the LED solder pads as close to the LED as possible.
10. Burn-In: Before any customer design qualification testing is performed, the sample Luminaires shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of +70°F (+21°C).
11. Any failure of the luminaire, which renders the unit non-compliant with the specification after burn-in, shall be cause for rejection.
12. The luminaire shall be tested as described herein.
    a. Luminaire performance shall be judged against the specified minimum illuminance in the specified pattern for a particular application.
    b. The luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy.

1) The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESNA Standard LM-80-08 test report, which ever one results in a higher level of lumen depreciation.

c. The luminaire may be determined to be compliant photometrically, if:
   1) The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern, and
   2) The depreciated minimum illuminance is maintained in at least 95% of the area of the specified lighting pattern, and
   3) The minimum length of the depreciated iso-footcandle curve is equal or greater than the length of the specified iso-footcandle curve.

3.8 QUALITY ASSURANCE TESTING (RANDOM SAMPLE TESTING)

A. Random sample testing may be performed on all shipments.

B. Testing shall be completed within 30 days.

C. All parameters of the specification may be tested on the shipment sample.

PART 4 - EXECUTION

4.1 INSPECTION AND PREPARATION

A. General

1. Install outlets, surface mounted, recessed or semi-recessed fixtures to maintain the alignment, spacings, layout and general arrangements indicated in the Drawings. Obtain approval of Engineer for all changes in layout required to avoid interferences with other trades.
2. Install one light fixture of each type and mounting for approval of Owner and Engineer prior to mounting all light fixtures.

B. Coordination

1. Work incorporating with ceiling trades in locating and framing recessed fixtures in acoustical tile pattern or grid system to conform to layout.
2. Inform affected trades of the location and framing details necessary for the installation of flush fixtures and deliver all framing rings of these fixtures that become a part of the ceiling construction.
3. Before equipment is ordered, electrical contractor to review luminaire and ceiling mechanical compatibility in each area and verify luminaire on the drawings. Contractor shall be responsible for all fixture quantities, lengths and clearances required and shall inform the Owner of the job conditions at variance with the fixture(s) specified or detailed which affect installation or location. (All stages of installation.)
4. Mechanical and electrical contractors are to review and coordinate lighting locations in relationship to mechanical systems to minimize conflicts prior to installation.
5. This contractor is responsible for coordinating the characteristics and the U.L. labeling of the luminaires and their components with the ambient conditions, which will exist when

the luminaires are installed. No extra compensation will be permitted for failure to coordinate the luminaires with their ambient conditions.

C. Mounting and Supports

1. Install luminaires in mechanical and unfinished areas after ductwork and piping installation.
2. Where luminaires are surface mounted, they shall be labeled for such and a minimum of one-half (1/2) inch air space and shall be maintained between top of luminaire and mounting surface by an approved means.
3. Pendant mounted units shall comply with the following:
    a. Where luminaires are mounted in a continuous row, luminaires, eight feet in length shall have stems placed within 2'-0" of end of fixture. Stems shall be spaced symmetrically. A fixture, four feet or three feet in length, placed in a row, shall have a stem connected to center luminaire.
    b. Individual luminaires, four feet in length, shall have two stems placed approximately 3 inches from each end.
    c. Individual luminaire, three feet in length, shall have dual stems and a single canopy.
    d. Each stem shall have a brass or steel swivel or other self-aligning device of type approved by the Engineer.
4. Where luminaires are mounted on surface-mounted outlet boxes in surface mounted conduit runs, this Contractor shall furnish and install a luminaire canopy sufficiently deep to permit exposed conduits to pass through. Canopy shall have proper openings cut by luminaire manufacturer through which conduits may pass. Submit sample of canopy for approval before installation.
5. Prior to final payment, this contractor shall clean all luminaires and replace any burned out LED modules. He shall also touch up all scratch marks, etc. in an approved manner.
6. Provide a minimum of two support points for all surface, pendant or recessed mounted luminaires. The supports shall be tied to the building structural system. The support points shall be totally independent of the ceiling system.
7. Recessed luminaires to be installed in metal panel or acoustic modular ceilings shall be modified as required to fit into openings in ceiling construction. Shop Drawings showing details shall be submitted for approval.
8. All luminaires in hung ceilings are to be installed with earthquake clips.

4.2 ADJUSTING AND CLEANING

A. At project completion, before final approval:

1. Aim adjustable fixtures as directed by Engineer and observe and adjust at night as required.
2. Clean interior of all fixtures, all lenses and LED modules.

END OF SECTION 265200

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Notification appliances.
5. Remote annunciator.
6. Addressable interface device.
7. Digital alarm communicator transmitter.

1.2 SYSTEM DESCRIPTION

A. Noncoded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level III minimum.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within [two] <Insert number> years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Amseco - a Potter brand; Potter Electric Signal Company.
2. Bosch Security Systems.
3. Commercial Products Group/CPG Life Safety Signals.
4. Faraday; Siemens Building Technologies, Inc.
5. Federal Signal Corporation.
6. Fire Control Instruments, Inc.; a Honeywell company.
7. Fire Lite Alarms; a Honeywell company.
8. Gamewell; a Honeywell company.
9. GE Infrastructure; a unit of General Electric Company.
10. Gentex Corporation.
11. Harrington Signal, Inc.
12. NOTIFIER; a Honeywell company.
13. Siemens Building Technologies, Inc.; Fire Safety Division.
14. Silent Knight; a Honeywell company.
15. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Smoke detectors.
3. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm-notification appliances.
2. Identify alarm at the fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
6. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

    a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
    b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 40 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

    a. Initiating Device Circuits: Style D.
    b. Notification Appliance Circuits: Style Z.
    c. Signaling Line Circuits: Style 6.
    d. Install no more than 50 addressable devices on each signaling line circuit.

2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

    a. Initiating Device Circuits: Style A.
    b. Notification Appliance Circuits: Style W.
    c. Signaling Line Circuits: Style 4.
    d. Install no more than 50 addressable devices on each signaling line circuit.

D. Notification Appliance Circuit: Operation shall sound in a circle.

E. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

F. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

G. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

H. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-level type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

2.6 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:
    a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, white.

2.7 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.8 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Zone of the supervisory signal.
3. Zone of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
2. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Smooth ceiling spacing shall not exceed 30 feet (9 m).
3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
4. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
5. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

E. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

H. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

I. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction, GCPS,

B. Tests and Inspections:

   1. Visual Inspection: Conduct visual inspection prior to testing.

      a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
      b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

   2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm

Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 283111

SECTION 31 10 00 -- SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Remove surface debris, paving, structures, slab concrete, curbing, sidewalks, etc.

B. Clear site of vegetation and grass within limit of disturbed area.

C. Remove trees and shrubs within limit of disturbed area, except those trees marked by the Owner to be saved.

D. Remove root system of trees and shrubs.

E. Remove all topsoil within the limits of work. Topsoil shall be stored in stockpiles with perimeter sediment control measures to control erosion and siltation.

F. Coordinate with utility companies to remove or relocate services for prosecution of the Work.

1.02 RELATED SECTIONS

A. Section 01 30 00 – Administrative Requirements: Requirements applicable to unit prices for the work of this Section.

B. Section 31 22 13 - Rough Grading.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable code for disposal of debris, and use of herbicides

B. Coordinate clearing Work with utility companies.

C. No work allowed in floodplain without Maryland Department of the Environment and Army Corps of Engineers permits.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that existing vegetation designated to remain, is tagged or identified.

3.02 PROTECTION

A. Locate, identify, and protect utilities that remain, from damage.

B. Protect trees, shrubs, and features designated to remain, as final landscaping.

C. Protect bench marks and property corners and existing structures, paving, curbing, sidewalk, etc., to remain from damage or displacement.

3.03 CLEARING

A. Clear as required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas indicated. Remove stumps, main root ball, and root system to a depth of 12 inches or as directed by the geotechnical engineer.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.04 REMOVAL

A. Remove debris, rock, and extracted vegetation from site.

3.05 TOPSOIL EXCAVATION

A. All salvaged topsoil shall be removed and stockpiled in piles protected by sediment controls.

B. Stockpile in area designated on site. Protect from erosion. Remove excess topsoil not being reused at no expense to the Owner.

C. Do not excavate wet topsoil prior to review and approval from geotechnical engineer

END OF SECTION

SECTION 31 22 13 -- ROUGH GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Remove all topsoil within the limits of work. Topsoil shall be stockpiled in designated areas, temporary seeded and surrounded with perimeter sediment controls.

B. Cutting, grading, filling and rough contouring the site.

1.02 RELATED SECTIONS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation: Building excavation.

C. Section 31 23 23.13 - Backfilling: General building area backfilling.

D. Section 32 91 19 - Landscape Grading: Finish grading with topsoil to contours.

1.03 REFERENCES

A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5 lb. Rammer and 12 inch drop.

B. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Samples: Submit 40-50 lb. sample of each type of fill to testing laboratory, in air-tight containers at least fourteen (14) days prior to start of construction.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00.

B. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Salvaged Topsoil: Surface material with some organic content, usually darker in color than subsoils, to be salvaged from the project which has been classified as topsoil, free of roots, rocks and clods larger than 1.5 inches, subsoil, debris, and large weeds. Refer to project geotechnical report boring logs, if available, for initial estimates of topsoil depths.

The removal of roots, debris, rocks, clods, etc., as previously described shall be accomplished before respreading topsoil for final dressing of slopes and other seeded or planted areas.

B. Subsoil: Excavated material, graded, free of lumps larger than 6 inches, rocks larger than 3 inches, and debris. Larger rocks may be included depending on location and with approval of Geotechnical Engineer, however large rocks can not be used in the top 24 inches of fill subgrades or where utility trenches are proposed.

C. Granular Fill: specified in Section 31 23 23.13.

D. Imported fill materials are to have Unified Soil Classification of ML, CL, SM, SP, SW, GM or GW. Imported soils are to have a liquid limit less than 40, plasticity indices less 12 and a minimum density of 105 pounds per cubic foot in accordance with ASTM-D698.

E. Hydrated lime, if required, for soil stabilization shall meet the requirements of MSHA Specifications Section 921.03.02.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions under provisions of Section 01 30 00.

B. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

F. Protect bench marks, property corners, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

G. Utility notification shall be the responsibility of the Contractor to assure themselves that no hazard exists or damage will occur to utilities. It is required that the Contractor contact "Miss Utility", 72 hours prior to the start of site work at 1-800-257-7777.

3.03 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Stockpile in areas designated on site and protect with silt fence or other sediment control measures. Remove excess sub-soil not being reused, from site at no expense to the Owner.

C. Do not excavate wet subsoil.

D. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.

3.04 FILLING

A. Fill areas to contours and elevations with unfrozen, suitable materials. All materials to be used as fill or backfill are to be inspected, tested and approved by the Geotechnical Engineer. Fill slopes shall be constructed as depicted in the plans. Maximum fill slopes shall not be steeper than 2:1 (horizontal to vertical)

B. Granular Fill: Place and compact materials in continuous layers not exceeding 12 inches in loose depth when compacting by heavy compaction requirements and a maximum of 6 inches in loose depth when compacting by hand-operated tampers or light compaction equipment. Compact to 95 % of maximum dry density in accordance with ASTM D-698.

C. Subsoil and Topsoil Fill: Place and compact material in continuous layer not exceeding 12 inches in loose depth when compacted by heavy compaction requirements and a maximum of 6 inches in loose depth when compacted by hand-operated tampers or light compaction equipment. Fills below structures are to be compacted to 95% of maximum dry density. Fills under paved areas are to be compacted to 95% with the top 12 inches compacted to 98% of maximum dry density.

D. After initial vegetation is stripped in areas to receive fill, proof roll the subsoil with a 10-ton fully loaded dump truck in the presence of the Geotechnical Engineer. Soft or unsuitable areas are to be removed and backfilled with suitable material. Mechanical drying, lime stabilization or soil mixing may be used in lieu of removal of unsuitable subgrades as approved by the Owner with supervision by the Geotechnical Engineer.

D. Maintain optimum moisture content of fill material to attain required compaction density. Air-drying, lime stabilization, soil mixing or replacement can be used under the guidance of the Geotechnical Engineer. Using mechanical drying or mixing of on site materials is to be first priority over other methods and will be performed at no additional cost to the Owner. Lime stabilization shall only be allowed with the approval of the Owner and performed under the guidance and supervision of the Geotechnical Engineer.

E. Slope grade away from building pad ½ inch in 1 foot for 10-foot distance unless noted otherwise. Carry building pad controlled subgrade 4’ beyond proposed exterior building wall.

F. Make grade changes gradual. Blend slopes into level areas.

G. Remove surplus fill materials from site at no expense to Owner.

H. During construction and after completion of the embankment and subgrade, the embankment and subgrade shall be maintained by the contractor until finally accepted. Embankments and subgrades which may be lost or displaced as a result of natural causes such as storms, cloudbursts, settlement, etc., shall be reworked and replaced with suitable materials from excavations or borrow. The travel path of any vehicles on the finished embankment or subgrade shall be held to a minimum to avoid displacement and rutting of the soil. When ruts 2 inches or more in depth are formed in the subgrade, they shall be removed by reshaping and recompacting.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot.

3.06 FIELD QUALITY CONTROL

A. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D2487.

B. Compaction testing will be performed in accordance with ANSI/ASTM D1556 and ASTM D 698.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Frequency of Tests: as specified in Section 31 23 16 - Excavation and Section 31 23 23.13 - Backfilling.

END OF SECTION

SECTION 31 23 16 -- EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation for building subgrades.

B. Excavation for road and paved area subgrades.

C. Excavation for sediment control and stormwater/sediment basins and sediment traps.

1.02 RELATED SECTIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Dewatering excavations and water control.

B. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.

C. Section 31 23 23.13 - Backfilling.

1.03 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

1.04 CLASSIFICATION OF EXCAVATION

A. Classified Excavation: Excavation is unclassified and includes all excavation to required subgrade elevations including but not limited to soil, different soil types, rock, concrete above and below ground, paving, gravel, boulders, masonry, foundations, abandoned utilities, dry soil, wet soils, etc. No excavation except for removal of unsuitable material below design subgrades will have a separate measurement or payment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, and other features remaining as a portion of final landscaping

F. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.02 EXCAVATION

A. Underpin adjacent structures, which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate building foundations, slabs-on-grade paving and site structures, and construction operations.

C. Machine slope banks to angle of repose or less, until shored.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rocks larger than 12 inches unless approved by Geotechnical Engineer.

H. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated by error.

K. Stockpile excavated material in area designated on site with adequate sediment control measures and remove excess material not being reused from site at no expense to Owner.

3.03 FIELD QUALITY CONTROL

A. Field inspection will be performed under the direction of the site geotechnical engineer.

3.04 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottoms of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION

SECTION 31.23 16.16 -- TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavate trenches for utilities as indicated on the plans from building to municipal utilities.

B. Compacted bedding under fill over utilities to subgrade elevations.

C. Backfilling and compaction requirements.

D. Compliance with utility specifications.

1.02 RELATED SECTIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Water control.

B. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.

C. Section 31 23 16 - Excavation: General building excavation.

D. Section 31 23 23.13 - Backfilling: General backfilling.

E. Section 33 11 00 – Water Utility Distribution Piping.

F. Section 33 41 00 – Storm Utility Drainage Piping.

G. Section 33 31 00 – Sanitary Utility Sewerage Piping.

1.03 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5 lb. Rammer and 12 inch drop.

1.04 SUBMITTALS

A. Submit under provision of Section 01 30 00.

B. Samples: Submit 40-50 lb sample of each type of fill to testing laboratory, in air-tight containers at least fourteen (14) days prior to the start of construction.

1.05 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

1.06 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures, which may be damaged by excavation work, including service utilities and pipe chases.

C. Notify Architect/Engineer of unexpected subsurface conditions and discontinues work in affected area until notification to resume work.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Types A, B, C, D, E Subsoil, Concrete and Imported Fill materials as specified in Section 31 23 23.13.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused, is acceptable. Consult with Geotechnical Engineer.

3.02 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Maintain and protect existing utilities remaining, which pass through work area.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

E. Protect above and below grade utilities which are to remain.

F. Cut out soft areas of subgrade not capable of insitu compaction in their natural and present state. Backfill withType E fill as specified in Section 31 23 23.13 or as directed by
Geotechnical Engineer and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION

A. Excavate subsoil required for utility piping to municipal utilities requirements or as detailed.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection. Minimum clearance shall be 6 inches on each side of pipe or conduit.

C. Excavation shall not interfere with normal 30 degree bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints, if required. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 6" and greater size.

F. Correct unauthorized excavation at no cost to Owner.

G. Correct areas over-excavated by error in accordance with Section 31 23 16 at no additional cost to the Owner.

H. Stockpile excavated material in area designated on site and remove excess material not being re-used from site at no expense to the Owner.

3.04 BEDDING

A. Support pipe or conduit during placement and compaction of bedding fill.

3.05 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Bedding Fill: Place and compact materials in continuous layers not exceeding 6 inches loose lifts when compacted by hand-operated or light compaction equipment.

D. Approved Subsoil Fill: Place and compact material in continuous layers not exceeding 6 inches loose lifts when compacted by hand-operated or light compaction equipment.

E. Employ a placement method that does not disturb or damage foundation perimeter drainage or conduit in trench.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Remove surplus backfill materials from site at no additional cost to Owner.

H. Leave fill material stockpile areas completely free of excess fill materials.

3.06 TOLERANCES

A. Top Surface of Backfilling: Under Paved Areas Plus or minus one inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus one inch from required elevations.

3.07 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the direction of the site geotechnical engineer.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D2487.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556 and D2922, ANSI/ASTM D698.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Tests: Minimum one (1) test every 150 lineal feet of trench or less for each layer tested with no fewer than two test per tested layer.

3.08 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

B. Recompact fills subjected to vehicular traffic.

3.09 SCHEDULE

A. Water, Gas, and Sanitary Piping:

1. Bedding Fill: Type B (Stone Dust) or as required by the City of Frederick for sanitary sewer and water lines, or to a depth of 6 inches above top of pipe. Compact to 95 percent maximum dry density.

2. Cover with Type E (Fill), in 12-inch loose lifts and compact.

B. Power Ducts

1. Bedding fill of Type B (Stone Dust) as detailed, compacted to 95 percent,

2. Remaining fill of Type E (Dirty Crushed Stone), to subgrade elevation.

C. Storm Drain

1. Wherever rock is encountered, it shall be removed and replaced with a minimum 6 in. of select backfill to provide a constant cushion under the pipe or bell. When unsuitable foundation material is encountered, it shall be removed and replaced with selected backfill for the full width of the trench, as directed by the Engineer. Compact to 95 % of maximum dry density.

2. Culverts 48 in. (1220 mm) or more in nominal horizontal diameter shall be bedded in Type B (stone dust) shaped by means of a template which will support the pipe for at least 10 percent of its overall height. Compact to 95% maximum dry density.

D. General Utility Information

1. Refer to Section 31 22 13 Rough Grading for compaction requirements, Paragraph 3.04 Filling.

2. All underground utility trenches shall be backfilled as specified and shall have a warning tape located in the upper part of the trench.

3. All plastic underground utilities shall in addition have a detection wire installed.

END OF SECTION

SECTION 31 23 23.13 -- BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site filling and backfilling.

B. Fill under slabs-on-grade and paving.

C. Fills around building.

D. Consolidation and compaction.

E. Fill for over-excavation.

1.02 RELATED SECTIONS

A. Section 00 91 14 – Subsurface Exploration and Geotechnical Engineering Report.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.16 - Trenching.

D. Section 32 91 19 - Landscape Grading: Filling of topsoil and to finish grade elevation.

1.03 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5 lb. Hammer and 12 inch drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Samples: Submit 40 lb. dry density sample of each type of fill to testing laboratory, in air-tight containers at least fourteen (14) days prior tot he start of construction.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type A - Coarse Stone: No. 57 Stone Angular, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
1 1/2 inch	100
1 inch	95 to 100
1/2 inch	25 to 60
No. 4	0 to 10

B. Type B - Stone Dust: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95 to 100
No. 16	45 to 85
No. 50	10 to 30
No. 100	0 to 10

C. Type C - Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 8	95 to 100
No. 100	0 to 25
No. 200	0 to 10

D. Type D - Structural Fill: Material greater than 105 PCF.

E. Type E - Select Fill: Dirty crushed stone (DCR-6), or soil material greater than 110 PCF. Graded aggregate material shall be in conformance with ASTM D2940 with the following limits:

Sieve Size	Percent Passing Range %	Tolerance %
2 in.	100%	- 2%
1 1/2 in.	95-100%	+5%
3/4 in.	70-92%	+8%
3/8 in.	50-70%	+8%
No. 4	35-55%	+8%
No. 30	12-25%	+5%
No. 200	0-8%	+3%

F. Subsoil: Reused or Imported, free of gravel larger than 3-inch size, and debris to be approved by Geotechnical Engineer.

G. Concrete: Structural concrete conforming to MSHA Mix No. 3 with a compressive strength of 3,500 psi.

H. Imported Fill: Unified Soil Classification of ML, CL, SM, SP, SW, GM or GW having a liquid Limit less than 40, plasticity index less than 12 and a maximum dry density of 105 pounds per cubic foot.

2.02 ACCESSORIES

A. None

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused are acceptable. Consult with Geotechnical Engineer. Soils classified as CH or MH are not to be used as fill below structures or paving.

3.02 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type D fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches loose depth if compacted with heavy equipment and 4 inches when compacted by hand operated or light compaction equipment.

D. Soil Fill: Place and compact material in continuous layers not exceeding 12 inches loose depth if compacted with heavy equipment and 6 inches when compacted by hand operated or light compaction equipment.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill against supported foundation walls. Do not back-fill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grades away from building minimum ½ inch in 10 ft, unless noted otherwise.

I. Make grade changes gradual. Blend slope into level areas.

J. Remove surplus backfill materials from site.

K. Leave required fill material stockpile areas completely free of excess fill materials, which are to be removed from the site.

3.04 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus one inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D2487.

B. Compaction testing will be performed in accordance with ANSI/ASTM D1556 or ASTM D2922.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Frequency of Tests:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in place density test for every 2000 sq. ft. or less, but in no case fewer than three tests per layer.

2. Trench Backfill: In each compacted initial and final layer and every other intermediate layer perform at least one test for each 150 feet or less of trench, but no fewer than two tests per tested layer.

3. Lawn and Unpaved Areas: In each of the two compacted initial and final layers and in every other intermediate layer, perform at least one test for every 10,000 sq. ft.

4. Stormwater Management Facility:
a. Compaction test for every 50 linear feet per lift of cut off trench.
b. Compaction test for every 25 linear feet per lift on each side of structure or pipes.
c. Compaction test for every 5, 000 sq. ft. per lift for embankment soils.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 50 00.

B. Recompact fills subjected to vehicular traffic.

3.07 SCHEDULE-COMPACTION

A. Fill Under Grass Areas:

1. Subgrade fill, compacted to 92 percent.

B. Fill Under Landscaped Areas:

1. Subgrade fill, compacted to 92 percent.

C. Fill Under Asphalt Concrete Paving:

1. Heavy Duty Paving

a. 95% compaction except for 98% compaction for last 12 inches.

2. Light Duty Paving and Play Areas

a. 95% compaction except for 98% compaction for last 12 inches.

D. Fill to Correct Over-excavation:

1. Type E fill, flush to required elevation, compacted to 95 percent at structures and paving and 92% at grass areas.

E. Trench Work (Under landscaped areas)

1. Type E fill, compacted to 92 percent.

F. Trench Work (under Asphalt Concrete Paving)

1. Type E fill to below finish paving elevation as scheduled, compacted to 95 percent, except last 12” to 98%.

G. Manhole, inlet, underground structure bedding.

1. Type E fill compacted at 95%.

H. Concrete Dumpster Pads and Loading Dock Drive

1. Type E fill to below finish paving elevation - compacted to 95 percent, except last 12” to 98%.

END OF SECTION

SECTION 31 25 00 -- EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Erosion and Sediment Control.

B. In case of disagreement between the approved Construction Plans and this section, the Plans shall govern.

PART 2 PRODUCTS

A. All materials shall be performed in accordance with the "2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control." This manual is available through Natural Resource Conservation Service (NRCS) formerly the Soil Conservation Service (SCS), at 92 Thomas Johnson Drive, Suite 230, Frederick, Maryland, 21702-4300, phone number 301-695-2803 x3 and on-line at: http://www.mde.maryland.gov/programs/Water/StormwaterManagementProgram/SoilErosionandSedimentControl/Documents/2011%20MD%20Standard%20and%20Specifications%20for%20Soil%20Erosion%20and%20Sediment%20Control.pdf.

PART 3 EXECUTION

3.01 EROSION AND SEDIMENT CONTROL

A. Furnish all labor, equipment and materials necessary to provide Erosion and Sediment Control for the project in accordance with the contract documents. Refer to the Sequence of Construction included in the approved plans.

B. All work shall be subjected to the inspection of the Frederick City Department of Permits And Code Management 301-360-3802 and the local Sediment Control Inspector 301-695-2803 x3.

C. All work shall be performed in accordance with the "2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control." This manual is available through Natural Resource Conservation Service (NRCS) formerly the Soil Conservation Service (SCS), at 92 Thomas Johnson Drive, Suite 230, Frederick, Maryland, 21702-4300, phone number 301-695-2803 x3 and on-line at: http://www.mde.maryland.gov/programs/Water/StormwaterManagementProgram/SoilErosionandSedimentControl/Documents/2011%20MD%20Standard%20and%20Specifications%20for%20Soil%20Erosion%20and%20Sediment%20Control.pdf.

D. The Contractor shall notify the Frederick City Engineering Department at 301-694-1405 of the date construction will begin seven (7) days prior to start of construction.

E. Any changes to the erosion and sediment control measures shown on the plans must be approved in advance by the Frederick Soil Conservation District.

F. The Contractor shall inspect all the sediment measures after each rainfall and make repairs if necessary. The Contractor is responsible for maintaining all the sediment erosion control measures until the disturbed areas are stabilized.

G. At the conclusion of construction, all disturbed areas shall be permanently stabilized in accordance with the contract documents and all temporary Erosion and Sediment Control Devices shall be removed and the areas permanently stabilized.

END OF SECTION

SECTION 31 37 00 -- RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap.

1.02 RELATED SECTIONS

A. Section 31 23 23.13 - Backfilling.

B. Section 31 23 16.16 - Trenching

C. Section 33 41 00 –Storm Utility Drainage Piping.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with Maryland Department of Transportation, State Highway Administration Standard Specifications - latest edition.

B. Maintain one copy of each document on site for Construction and Materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap Materials: Provide in accordance with Maryland Department of Transportation, State Highway Administration "Standard Specifications for Construction and Materials" dated October 1993, including the latest revisions.

B. Riprap: Limestone type; broken stone irregular shaped rock; solid and nonfriable; minimum size, as indicated.

C. Filter Cloth: Refer to Maryland State Highway Administration Specifications Section 921.09, Class E.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place riprap over frozen or spongy subgrade surfaces.

3.02 PLACEMENT

A. Place geotextile fabric over substrata, lap edges and ends.

B. Place riprap at the discharge end of drainage structures as indicated on plans.

C. Installed Thickness: as indicated on plans.

3.03 SCHEDULES

A. Culvert Pipe Ends: Riprap shall not be placed until area is stabilized.

END OF SECTION

SECTION 32 12 00 – FLEXIBLE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphaltic concrete paving and surface sealer; wearing binder or base course.

B. Aggregate base course.

C. Pavement markings.

1.02 RELATED SECTIONS

A. Section 00 91 14 - Subsurface Exploration and Geotechnical Engineering Report.

B. Section 32 13 00 - Rigid Paving.

1.03 REFERENCES

A. Maryland Dept. of Transportation State Highway Administration Standard Specifications for Construction and Materials - latest edition.

B. MS-3 - Asphalt Plant Manual - The Asphalt Institute (AI) - latest edition.

C. MS-8 - Asphalt Paving Manual - The Asphalt Institute (AI) - latest edition.

D. MS-19 - Basic Asphalt Emulsion Manual, The Asphalt Institute (AI) - latest edition.

E. ASTM D946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.

1.04 PERFORMANCE REQUIREMENTS

A. Paving: Designed for parking school buses, light duty commercial vehicles, and passenger cars.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with AI Manual MS-8 and State of Maryland Highways standards.

B. Mixing Plant: Conform to AI Manual MS-3 and State of Maryland Highways Public Work's standard.

C. Obtain materials from same source throughout.

D. Maintain one copy of each document on site.

1.06 SUBMITTALS

A. Submit certification in accordance with Section 01 30 00 that materials and products meet or exceed specified requirements.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place surface asphalt until base surface temperature is 40 degrees F and rising, and at least 32 degrees F and rising for placing base asphalt. Do not place pavement if surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: In accordance with State of Maryland Highways Standards. No Bid Price adjustment for fluctuations in the price of asphalt cement will be allowed under this Contract.

B. Aggregate for Binder Course Mix: In accordance with State of Maryland Highways standards.

C. Aggregate for Wearing Course Mix: In accordance with State of Maryland Highways standards.

D. Fine Aggregate: In accordance with State of Maryland Highways standards.

E. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

2.02 ACCESSORIES

A. Tack Coat: Homogeneous, medium curing, liquid asphalt in accordance with State of Maryland Highways standards.

B. Joint Sealer: Hot applied joint filler meeting the requirements of AASHTO and M173.

1. Apply in accordance with manufacturer's recommended pouring temperature with a minimum thickness of 1/2 inch.

2.03 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2 and State of Maryland Highways standards.

C. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2 and State of Maryland Highways standards.

2.04 PAVEMENT MARKINGS

A. Pavement Marking: Alkyd Resin Type, 75% solids by weight and 54% solids by volume equal to PPG's eleven (11) series. Federal Spec. (GSA-FES) TT-P-115F Type I. Colors shall be provided in white, yellow and blue.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted granular base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Section 31 23 23.13 - Backfilling: Type E forms the base construction for work of this Section.

3.03 PREPARATION - TACK COAT

A. Apply tack coat in accordance with AI MS-19 and State of Maryland Highways Standards.

B. Apply tack coat to contact surfaces of curbs and gutters.

C. Coat surfaces of manhole catch basin and frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of Maryland Highways Standards.

B. Place asphalt within 24 hours of applying tack coat.

C. Maximum compacted depth for a single course shall not exceed 4 inches.

D. Install gutters, drainage grates and frames and manhole frames in correct position and elevation.

E. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Install work in accordance with State of Maryland Highway Standards.

B. Place asphalt within 24 hours of applying tack coat.

C. For course layers greater than 4 inches, place in multiple lifts with no single lift greater than 3 inches of compacted depth.

D. Place wearing course within 48 hours of placing and compacting base binder course.

E. Place wearing course(s) to 1 1/2 inch to 2 inches compacted thickness.

F. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.

G. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

H. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.07 JOINT SEALERS

A. Apply joint sealer in accordance with manufacturer's recommended pouring temperature at a minimum thickness of 1/2 inch.

3.08 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.09 PAVEMENT MARKINGS

A. Lines shall be a minimum 4 inches wide applied with one coat of specified product. Colors shall be as selected by the Architect in blue, white and yellow.

3.10 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for seven (7) days.

3.11 PAVEMENT SCHEDULE

A. Refer to contract plans.

END OF SECTION

SECTION 32 13 00 – RIGID PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete for stormwater management and sediment control structures, collars, slabs and miscellaneous site concrete items (curb and gutter, sidewalks and ground slabs).

B. Aggregate base courses.

1.02 RELATED SECTIONS

A. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.

B. Section 31 23 23.13 - Backfilling: Compacted subbase for paving.

1.03 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

E. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

F. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

G. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

H. ASTM C33 - Concrete Aggregates.

I. ASTM C94 - Ready Mix Concrete.

J. ASTM C150 - Portland Cement

K. ASTM C260 - Air-Entraining Admixtures for Concrete.

L. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

M. ASTM C494 - Chemical Admixtures for Concrete.

N. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.04 PERFORMANCE REQUIREMENTS

A. Air entrain to protect against freeze thaw cycles.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data on joint filler admixtures curing compounds.

1.06 QUALITY ASSURANCE

A. Submit certifications that mix design and materials conform to MSHA Mix No. 2 or better.

B. Obtain cementitious materials from same source throughout.

1.07 REGULATORY REQUIREMENTS

A. Refer to MD 378 requirements and Department of Environment (MDE) and/or Corps of Engineers Permits as they apply to this work.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: As specified in Section 03 30 00.

B. Joint Filler: Flexible foam expansion joint filler complying with ASTM D1752, Sections 5.1 through 5.4; 1/2 inch thick, Ceramar by W. R. Meadows with water absorp-tion of 0.24% of volume as tested in accordance with ASTM D545.

2.02 REINFORCEMENT

A. Reinforcing Steel ASTM A 615, Grade 60. Wire Fabric ASTM A 185 in flat sheets.

B. Dowels: ASTM A 615; 60 ksi yield grade, smooth, plain steel, unfinished finish.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in MSHA specifications.

B. Fine and Coarse Mix Aggregates: ASTM C33.

C. Water: Potable, not detrimental to concrete.

D. Air Entrainment: ASTM C260.

E. Chemical Admixture: ASTM C494, Type A - Water Reducing

2.04 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1; clear manufactured by Sonneborn.

B. Liquid Surface Sealer: manufactured by Sonneborn.

C. Air Entrainment: ASTM C260; DARAVAIR 1000 manufactured by W. R. Grace.

2.05 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Mix and deliver concrete in accordance with ASTM C94, Alternative No. 2.

B. Select proportions for normal weight concrete in accordance with ACI 301 Method 2.

C. Provide concrete to the following minimum criteria:

1. Compressive Strength: 2200 psi @ 7 days.
2. Compressive Strength: 3000 psi @ 28 days.
3. Slump: ASTM C94.

D. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.

E. Calcium chloride will not be permitted.

F. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.

G. Add air-entraining agent to normal weight concrete mix for work exposed to exterior at a rate of 4-7 percent air content.

2.06 SOURCE QUALITY CONTROL

A. Provide certified mix design as to meeting MSHA Mix No. 2 or better.

B. Submit test results on cement and aggregates to ensure conformance with specified requirements.

C. Test samples in accordance with MSHA criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify gradients and elevations of subgrade are correct.

3.02 FORMING

A. Place and secure forms to correct location, dimension, and profile. For curb pours, provide string lines for review and inspection by Owner's representative prior to pouring concrete. Irregularities shall be adjusted or corrected before further work progresses.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.03 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at expansion joints.

C. Place reinforcement to achieve pavement and curb alignment as detailed.

D. Provide doweled joints 12 inch o.c. at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Ensure reinforcement, inserts, embedded parts; formed joints are not disturbed during concrete placement.

C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.05 JOINTS

A. Place expansion joints at 20 foot intervals. Align curb, gutter, and sidewalk joints. For onsite sidewalks, the expansion joints shall be neoprene (w/ "zip strip") or other material that resists decay and shall be caulked.

B. Place joint filler between paving components and building or other appurtenances. Recess the top of filler 1/2 inch for sealant placement by Section 07900.

C. Provide scored joints at intervals indicated on drawings at 2 inch depth.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the direction of the site geotechnical engineer.

B. Three concrete test cylinders will be taken for every 50 or less cu yds of concrete of each class placed each day. Cylinders shall be tested on 7 and 28-day intervals, the third cylinder shall be tested if a failure should occur and be utilized as a comparision.

C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

D. One slump test and air content test will be taken for each set of test cylinders taken.

E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.07 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 91 19 -- LANDSCAPE GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Final grade topsoil for finish slopes, curb islands, planting beds and other green areas.

1.02 RELATED SECTIONS

A. Section 01 30 00 – Administrative Requirements: Requirements applicable to unit prices for the work of this Section.

B. Section 31 10 00 – Site Clearing

C. Section 31 22 13 - Rough Grading: Site contouring.

D. Section 31 23 23.13 - Backfilling: Backfilling at building areas.

E. Section 32 92 19 - Seeding: Finish ground cover.

PART 2 PRODUCTS

2.01 MATERIAL

A. Topsoil is available for reuse, but should meet the organic and pH requirements of Para. B. Amendments required to salvaged topsoil must be reviewed and approved by the Owner and will be considered additional work to the Contractor. However, the Owner reserves the right to waive any and all organic or pH requirements at the Owner discretion for salvaged on site topsoil.

B. Additional topsoil beyond that of which is available from stripping operations on site shall be natural friable soil representative of productive soils in the area. It shall be obtained from well drained off site borrow areas provided by the Contractor. The topsoil shall be free of any admixture of subsoil, foreign matter, objects larger than 1.5 inches in any dimension, toxic substance, Johnsongrass, Canadian Thistle, or Phragmites and any material or substance that may be harmful to plant growth or seed germination. The pH range shall be between 6.0 and 7.0. Organic content shall be between 1.5-10 percent. The Contractor at his own expense shall amend furnished topsoil to meet the requirements of this Section.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility and storm drain and trench backfilling has been inspected.

B. Verify substrate base has been contoured and compacted.

3.02 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, hard clods and stones in excess of 1-1/2 inches in size prior to final respeading of topsoil.

C. Scarify subgrade to depth of 2 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.03 PLACING TOPSOIL

A. Place topsoil in areas where seeding and planting to thickness as scheduled. Place topsoil during dry weather.

B. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks and foreign and objectionable material prior to final spreading. The Contractor shall submit his method of removal of objectionable materials within the topsoil to the Owner for review and approval prior to performing the work.

D. Lightly compact placed topsoil.

E. Remove surplus subsoil from site at no additional cost to the Owner. Topsoil shall be stockpiled on site as located by the Owner and seeded with temporary seed.

3.04 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.05 PROTECTION

A. Protect trees, building pads and areas to be paved and other features remaining as final work.

B. Protect existing structures, fences, sidewalks, utilities, paving and curbs.

3.06 SCHEDULES

A. Compacted topsoil thickness at the following areas:

1. Seeded Grass: 6 inches. Depth may be reduced to 4” as a minimum and increased if required to use up excess topsoil.

END OF SECTION

SECTION 32 92 19 -- SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seeding, mulching and fertilizer.

B. Maintenance.

1.02 RELATED SECTIONS

A. Section 31 23 23.13 - Backfilling: Rough grading of site.

B. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.

1.03 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 MAINTENANCE DATA

A. Submit under provisions of Section 01 70 00.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.06 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.07 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

C. Provide soils analysis report per Article 2.03.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilized in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.09 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition and until contract completion.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. MSHA seed mixture No. 2, except application rate shall be 6 lbs. per 1000 s.f.

2.02 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: FS O-F-241, Type recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.

C. Water: Clean, fresh and free of substances or matter, which could inhibit vigorous growth of grass.

D. Erosion Fabric: Machine produced mat of wood fibers, wood excelsion or biodegradable man made fabric such as “Curlex.

E. Herbicide: As approved by seeding manufacturer.

F. Stakes: Softwood lumber, chisel pointed.

G. String: Inorganic fiber.

2.03 TESTS

A. Provide analysis of salvaged and furnished topsoil fills under provisions of Section 32 91 19.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Submit minimum 16-oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.03 SEEDING

A. Apply seed at rate indicated. Apply evenly in two intersecting directions with one half application in each direction. Temporary seed areas in the interim that cannot be permanently seeded as required.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: Sept. 15, to Oct. 15, or March 15, to June 15.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Roll seeded area with roller not exceeding 112 lbs.

F. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 in. Maintain clear of shrubs and trees.

G. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

H. Approved hydroseeding methods can be used as an alternate method of turf establishment.

3.04 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 36 inches. Space stakes at 96 inches.

B. Cover seeded slopes where grade is 2.5’ horizontal to 1’ vertical or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Provide 4-inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 18 inch staggered intervals with no. 11 wire gage staples.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.05 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing. Maintain maintenance throughout the construction contract.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas, which show bare spots.

H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 32 93 00 -- PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. New trees, shrubs, and ground cover for landscaping

B. Reforestation plantings and fencing per Final Forest Conservation Plan

C. Mulch and fertilizer.

D. Maintenance.

1.02 RELATED SECTIONS

A. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.

B. Section 32 92 19 – Seeding.

1.03 REFERENCES

A. FS O-F-241 - Fertilizers, Mixed, Commercial.

B. ANSI Z60.1 - Nursery Stock.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Plants: Living trees, shrubs, and ground cover specified in this Section, and described in ANSI Z60.1.

1.05 MAINTENANCE DATA

A. Submit under provisions of Section 01 70 00.

B. Operation Data: Submit for continuing Owner maintenance.

C. Maintenance Data: Include cutting and trimming method; types, application frequency, and recommended coverage of fertilizer.

1.06 QUALITY ASSURANCE

A. Provide inspection and testing for verifying acceptability of plants, robustness, and life expectancy.

1.07 QUALIFICATIONS

A. Nursery: Company specializing in growing and cultivating the plants with three years documented experience.

B. Installer: Company specializing in installing and planting the plants with three years documented experience approved by nursery.

C. Maintenance Services: Performed by installer.

1.08 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture.

C. Plant Materials: Free of disease or hazardous insects.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Protect plants until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or above 90 degrees F.

B. Do not install plants when wind velocity exceeds 30 mph.

1.11 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

B. Provide one-year warranty under provisions of Section 01 70 00 for landscape plantings.

C. Landscape Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

D. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

1.13 GENERAL MAINTENANCE SERVICE

A. Maintain landscape plant life immediately after placement until plants are well established and exhibit a vigorous growing condition. Continue maintenance until termination of warranty period.

B. Landscape Maintenance to include:
1. Cultivation and weeding plant beds and tree pits.
2. Applying herbicides for weed control in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
3. Remedy damage from use of insecticides.
4. Irrigating sufficient to saturate root system.
5. Pruning, including removal of dead or broken branches, and treatment of pruned areas or other wounds.
6. Disease control.
7. Maintaining wrapping, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

PART 2 PRODUCTS

2.01 TREES, SHRUBS, AND GROUND COVER

A. Trees, Shrubs and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.

2.02 SOIL MATERIALS

A. Topsoil: Refer to Section 32 91 19.

2.03 SOIL AMENDMENT MATERIALS

A. Fertilizer: FS O-F-241; as recommended; with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.

B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

C. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

D. Lime: Ground limestone, dolomite type, and minimum 95 percent carbonates.

E. Water: Clean, fresh and free of substances or matter, which could inhibit vigorous growth of plants.

F. Herbicide: As recommended by Nursery.

G. Pesticide: As recommended by Nursery.

2.04 MULCH MATERIALS

A. Mulching Material: Shredded, aged hardwood free of deleterious materials.

2.05 ACCESSORIES

A. Wrapping Materials: Burlap.

B. Stakes: Softwood lumber, pointed end.

C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resultant movement of plant life.

D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

E. Membrane: 20 mil thick, black water permeable polyolefin fabric.

F. Edging: Galvanized steel edging equal to Reyerson steel edging.

2.06 TESTS

A. Provide analysis of any imported topsoil under provisions of Section 32 91 19.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter and pH value.

C. Submit minimum 10 oz sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil is ready to receive work.

B. Saturate soil with water to test drainage.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoils to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoils to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 6 inches larger than plant root system.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.04 PLANTING

A. Place plants in accordance with drawings.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared topsoil mixture, at a minimum depth of 6 inches under each plant. Remove or loosen burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inches layers. Maintain plant materials in vertical position.

F. Saturate soils with water when the pit or bed is half full of top soil and again when full.

G. Apply mulches as detailed.

3.05 TREE SUPPORT

A. Brace trees vertically with plant protector wrapped guy wires and stakes to the following:

Tree Caliper	Tree Support Method
1 inch (25 mm)	1 stake with one tie
1 - 2 inches (25 - 50 mm)	2 stakes with two ties
2 - 4 inches (50 - 100 mm)	3 guy wires with eye bolts and turn buckles
Over 4 inches (100 mm)	4 guy wires with eye bolts and turn buckles

3.06 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 70 00.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.07 MAINTENANCE

A. Neatly trim plants where necessary.

B. Immediately remove clippings after trimming.

C. Water to prevent soil from drying out.

D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

E. Apply pesticides in accordance with manufacturers instructions. Remedy damage resulting from improper use of pesticides.

END OF SECTION

SECTION 33 11 00 – WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water line including domestic water line and fire water line.

B. Valves and fire hydrants.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 22 05 23 - Pipe and Pipe Fittings: Supply of connection devices to building water main piping for placement by this Section.

1.03 RELATED SECTIONS

A. Section 31 23 16 - Excavation.

B. Section 31 23 23.13 - Backfilling.

C. Section 31 23 16.16 - Trenching.

D. Section 33 13 00 - Disinfection of Water Distribution System: Disinfection of site service utility water piping.

1.04 REFERENCES

A. ANSI/ASTM 698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5 lb. Rammer and 12 inch Drop.

B. ANSI/AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fitting for Water.

C. ANSI/AWWA C111 – Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings..

D. ANSI/AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other liquids.

E. ANSI/AWWA C500 – Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.

F. ANSI/AWWA C502 – Dry Barrel Fire Hydrants.

G. ANSI/AWWA C504 – Rubber Seated Butterfly Valves..

H. ANSI/AWWA C509 – Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.

I. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Appurtenances.

J. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

K. ASTM D3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00.

B. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with local or state regulatory/inspecting jurisdiction.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Perform all work in accordance with Code Authority standards.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 MANUFACTURERS - WATER PIPE

A. All pipe, fittings, valves, hydrants and other related materials used in the of additions to the water distribution system must comply fully with the specifications and requirements of the local/State regulatory/inspecting jurisdiction. All water line installations shall be new and unused cast iron and/or ductile iron pipe fittings and valves of the size, type and character outlined in the following specifications.

2.02 PIPE

A. Ductile Iron Pipe: ANSI/AWWA C151:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: ANSI/AWWA C111, rubber gasket with rods.
   3. Jackets: ANSI/AWWA C105 polyethylene jacket Double layer, half lapped, 10 mil polyethylene tape.

B. Copper Tubing: ASTM B88, Type K, annealed:
   1. Fittings: ANSI/ASME B16.18, cast copper, or ANSI/ASME B16.22, wrought copper.
   2. Joints: Compression connection or ANSI/AWS A5.8, BCuP silver braze.

2.03 GATE VALVES - 3 Inches and Over

A. Manufacturers:
   1. American Darling Valve and Manufacturing Co.
   2. A.P. Smith Co.

B. ANSI/AWWA C500, Cast Iron body, bronze trim, non-rising stem with square nut, single wedge, mechanical joint ends, control rod, and extension box.

2.04 HYDRANT

A. Hydrant: Type as required by Code Authority.

2.05 BEDDING AND BACKFILL MATERIALS

A. Bedding: Fill Type B (Stone Dust) as specified in Section 31 23 23.13 and 31 23 16.16.

2.06 ACCESSORIES

A. Concrete for Thrust Blocks: As detailed or in accordance with governing authority.

B. Backflow Preventer: as detailed or in accordance with governing authority.

C. Meter: as detailed or in accordance with governing authority.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions under provisions of Section 01 30 00.

B. Verify that building service connection and municipal utility water main size, location and invert are as indicated.

3.02 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16.16 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.

C. Backfill around sides and to top of pipe with fill, tamped in place and compacted to 95 percent.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Maintain vertical and horizontal separation of water main from sewer piping in accordance with the local/State regulatory and inspecting jurisdiction.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb and locate pumper nozzle perpendicular to roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches mm washed gravel. Encase elbow of hydrant in gravel to 150 mm above drain opening. Do not

connect drain opening to sewer.

G. Paint hydrants in accordance with Frederick City requirements.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with local/State regulatory and inspecting jurisdiction.

3.07 SERVICE CONNECTIONS

A. Provide water service as required by the regulatory and inspecting jurisdiction with water meter and by-pass valves.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the direction of the site geotechnical engineer.

B. Compaction testing will be performed in accordance with ASTM 698 and ASTM 1556.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Frequency of Tests:

1. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

2. Hydrostatic Tests: Test at 200 psi for 2 hours, according to applicable local/State regulatory and inspecting jurisdiction's requirements.

3. Contractor is responsible for providing all water for line test and disinfecting.

END OF SECTION

SECTION 33 13 00 -- DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of potable water distribution and transmission system in accordance with the following or the local/State regulatory jurisdiction's criteria, which ever is the more stringent.

B. Testing and reporting results.

1.02 RELATED SECTIONS

A. Section 33 11 00 – Water Utility Distribution Piping.

1.03 REFERENCES

A. ANSI/AWWA B300 - Standard for Hypochlorites.

B. ANSI/AWWA B301 - Standard for Liquid Chlorine.

C. ANSI/AWWA B302 - Standard for Ammonium Sulfate.

D. ANSI/AWWA B303 - Standard for Sodium Chlorite.

E. ANSI/AWWA C651 - Standards for Disinfecting Water Mains.

1.04 SUBMITTALS

A. Test Reports: Indicate results comparative to specified requirements.

B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00.

B. Disinfection reports; record:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.

4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological report; record:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of City of Frederick.
8. Bacteriologist's signature and authority.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/AWWA C651.

1.07 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing examining potable water systems, certified by the State of Maryland.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code or regulation for performing the work of this Section.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. All chlorinating materials shall conform to AWWA standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected and pressure tested.

B. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 EXECUTION

A. Provide and attach required equipment to perform the work of this Section.

B. Introduce treatment into piping system.

C. Maintain disinfectant in system for 24 hours.

D. Flush, circulate and clean until required cleanliness is achieved; use municipal domestic water.

E. Replace permanent system devices removed for disinfecting.

F. Pressure test system to not less than 200 psi. Repair leaks and re-test.

G. Contractor shall provide all water required for testing and disinfecting.

3.03 QUALITY CONTROL

A. Test samples in accordance with ANSI/AWWA C651.

END OF SECTION

SECTION 33 31 00 -- SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, accessories and bedding.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout access.

D. Work to conform to local/State regulatory jurisdiction's Standards and Construction Specifications.

1.02 RELATED SECTIONS

A. Section 31 23 16.16 - Trenching: Excavating subsoil for sewer system piping.

B. Section 31 23 16.16 - Trenching: Backfilling over piping up to subgrade elevation and underside of fill under paving a slab.

C. Section 33 41 00 - Storm Utility Drainage Piping.

D. Section 32 13 00 – Rigid Paving.

1.03 REFERENCES

A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5 lb. Hammer and 12 inch drop.

C. ANSI/ASTM D1556 - Test Methods for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

E. ANSI/ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

F. ASTM A746 - Ductile Iron Gravity Sewer Pipe.

G. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data indicating pipe, and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed requirements.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 70 00.

B. Record location of pipe runs, connections, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work in accordance with local/State regulatory jurisdiction’s Standard Construction Specifications.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated.

1.09 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

B. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. All pipe, fittings and other related materials used on the construction of additions to the sanitary sewer system must comply fully with the specifications and requirements of the Local/State regulatory jurisdiction.

B. Plastic Pipe: ASTM D3034, S.D.R. 26, Poly (Vinyl Chloride) material; inside nominal diameter of 4, 6 and 8 inches, bell and spigot style solvent sealed joint end.

2.02 PIPE ACCESSORIES

A. Gaskets: ASTM F4777, elastomeric seal.

B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sanitary Sewer Service" in large letters.

2.03 BEDDING AND BACKFILL MATERIALS

A. Bedding: Fill Type B (Stone Dust) as specified in Section 31 23 23.13 and 31 23 16.16.

B. Backfill: Fill Type E as specified in Section 31 23 23.13 and 31 23 16.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16.16 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth compact to 95 percent.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C12 and manufacturer's instructions. Seal joints watertight.

B. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.

C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches in compacted layers, which shall not exceed 6 inches each. See section 31 23 23.13 for compaction requirements.

D. Refer to Section 31 23 16.16 for trenching requirements. Do not displace or damage pipe when compacting.

E. Connect to building sanitary sewer outlet and municipal sewer system.

F. Install trace wires continuous over top of pipe. Buried 6 inches below finish grade, above pipe line; coordinate with Section 31 23 16.16.

3.05 INSTALLATION - CLEANOUTS

A. Form bottoms of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.06 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing bedding.

B. Compaction testing will be performed in accordance with ASTM 698 and ASTM 1556.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Frequency of Tests: Perform testing of completed piping in accordance with the Inspecting jurisdiction’s requirements or at Owner's request.

3.07 PROTECTION

A. Protect finished installation under provisions of Section 01 50 00.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 41 00 -- STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site storm sewerage drainage piping, fittings, structures, accessories, and bedding.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. None.

1.03 RELATED SECTIONS

A. Section 31 23 16.16 - Trenching: Excavating for sewer system piping.

B. Section 31 23 16.16 - Trenching: Backfilling over piping up to subgrade elevation and underside of fill under paving.

C. Section 33 49 00 – Storm Drain Structures.

D. Section 33 31 00 – Sanitary Utility Sewerage Piping.

E. Section 32 13 00 – Rigid Paving: Concrete type for catch basin, cleanout and head wall base pad construction.

1.04 REFERENCES

A. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

C. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

D. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5 lb. Hammer and 12 inch Drop.

E. ANSI/ASTM D1556 - Test Methods for Density of the Soil by the Sand-Cone Method.

F. ANSI/ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

G. ANSI/ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

H. ANSI/ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

I. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

J. AASHTO M294 – smooth bore high-density polyethylene pipe, type S. In limestone areas all pipe joints to be WT (watertight).

1.05 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.06 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data indicating pipe, and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed requirements.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00.

B. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 30 00.

B. Coordinate the Work with termination of storm sewer connection outside building, and

trenching.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Concrete Pipe ASTM C76, Class IV tongue and groove joints with mastic joint compound.

B. Smooth Interior Corrugated Polyethylene Pipe: Conform to AASHTO M294, Type S. Joints to be manufacturer certified as watertight.

C. Aluminized Steel Pipe, Type II Ultra Flo: Conform to ASTM A929 and A760.

2.02 CATCH BASINS, MANHOLES, AND MISC. STRUCTURES

A. Refer to local regulatory jurisdiction's details and MSHA Standards Details.

2.03 BEDDING AND BACKFILL MATERIALS

A. Bedding: Fill Type B (Stone Dust) as specified in Section 31 23 23.13 and 31 23 16.16.

B. Backfill: Fill Type E as specified in Section 31 23 23.13 and 31 23 16.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16.16 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layers not exceeding 6 inches of compacted depth for each layer required.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM C12 and manufacturer's instructions. Seal joints watertight.

B. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.

C. Install aggregate at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches, compact to 95 percent.

D. Refer to Section 31 23 16.16 for trenching requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 33 49 00 for manhole requirements.

F. Connect to building collection system.

3.05 INSTALLATION - CATCH BASINS, MANHOLES AND MISC. STRUCTURES

A. Form bottoms of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

C. Level top surface of base pad to receive concrete shaft sections, sleeved to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated.

E. Mount grate and frame level in grout, secured to top section to elevation indicated.

3.06 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing aggregate cover over pipe.

B. Compaction testing will be performed in accordance with ANSI/ASTM D698 and ASTM 1556.

C. If tests indicate Work does not meet specified requirements, remove Work, and replace and retest.

D. Frequency of Tests: Refer to Section 31 23 23.13 Backfilling, Paragraph 3.07.

3.07 PROTECTION

A. Protect finished Work under provisions of Section 01 50 00.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.08 STORMWATER MANAGEMENT ASBUILT SURVEY

A. The Contractor is responsible for having a Maryland Professional Engineer or Registered Survey perform and asbuilt survey of the completed stormwater management facility(s). During construction it is the Contractor's responsibility, unless stated otherwise in the contract or job specifications, to have the appropriate inspections performed by a professional to verify the installed components conform to the design plans and specifications and meet the required material and compaction requirements.

B. The following items must be addressed as a minimum asbuilt requirement.

1. Location shown in red on three copies of the approved design plans.
2. Provide red lined asbuilt contours and spot elevations to verify design conformance.
3. Provide red check marks verifying installation of plants, pipes, structures, top elevations, inverts, lengths, widths, heights, etc.
4. Provide spot elevations to verify that the site drainage reaches the facility
5. Provide an asbuilt certification signed by a Maryland Professional Engineer or Surveyor stating that the construction is in conformance with the approved plans and/or as highlighted on the asbuilt plans.
6. Provide testing agency certification that materials and construction conforms to design plans and specifications.

.

END OF SECTION

SECTION 33 49 00 – STORM DRAINAGE STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete manholes and inlets with masonry transitions, lid frames, covers, anchorages and accessories or modular precast with tongue and groove joints at Contractor's option.

1.02 RELATED SECTIONS

A. Section 31 23 16 - Excavating.

B. Section 31 23 23.13 – Backfilling.

C. Section – Rigid Paving.

1.03 REFERENCES

A. ANSI/ASTM C55 - Concrete Building Brick.

B. ASTM A48 - Gray Iron Castings.

C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

D. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

E. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

F. Maryland State Highway Administration Standards and Specifications.

G. Construction Details and Construction Specifications for local regulatory/inspecting jurisdiction.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate manholes locations, elevations, piping, and sizes and elevations of penetrations.

C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years documented experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Cold Weather Requirements: IMIAC - Recommended Practices and Specifications for Cold Weather Masonry Construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced cast-in-place concrete as specified in MSHA Section 305.

B. Concrete Brick Units: MSHA Section 903.02.

C. Mortar for Grout: As specified in MSHA Section 902.11.

D. Reinforcement: MSHA Section 908.

E. Mortar for Masonry: MSHA Section 903.06.

2.02 COMPONENTS

A. Lid and Frame: ASTM A48, Class 30B Cast iron construction, machined flat bearing surface, removable lid, open checkerboard grille lid design; live load rating of 100 psf; lid molded with identifying name.

B. Manhole Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections. Meet MSHA Specifications.

2.03 CONFIGURATION

A. Shaft Construction: Concentric with eccentric cone top section; lipped male/female dry joints; sleeve to receive pipe sections.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inch diameter, unless otherwise noted.

D. Design Depth: As indicated.

E. Clear Lid Opening: As indicated.

F. Pipe Entry: Provide openings.

G. Steps: 10 inches wide, 12 inches on center vertically, set into manhole wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.